

THE PRACTITIONER

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THE PRACTITIONER

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Fractures and Accidents

Introduction

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HAVING been asked by the Editor to write a short introduction on fractures for this special number of THE PRACTITIONER, which comprises a group of important contributions, I have read the advance proofs of the articles, but, in any case, it would be out of place for me to offer any criticism on the opinions and practice of my distinguished colleagues. My remarks will, therefore, be general and must largely be a repetition of views I have so often expressed

Whatever method we employ in the treatment of fractures, its object must be the restoration of complete function with the least risk and inconvenience to the patient, together with the least anxiety to the surgeon. To attain this end we should have constantly before us a clear idea of the disabilities and deformities which are commonly encountered in the neglected or inadequately treated case.

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and very rarely have I had any shortening which could prove a functional disability. Consequently I can find no occasion to plan an open reduction. With others less experienced in manipulative and mechanical methods the problem must be attacked from another angle. The same is true of fractures of the humerus.

We should look upon every fracture as the potential cause of disability. Study of and recollection of the deformities in the neglected cases will help us materially to avoid mal-union. For example, in fractures of the neck of the femur we find an elevated pelvis, adduction and flexion with external rotation of the hip in addition to shortening. In treating the recent case, therefore, we must secure length by extension, and lock the fractured ends by internal rotation and abduction. This fracture is held in position by capsular tension further augmented by contact of the trochanter with the side of the pelvis, while in the sub-capital variety the fracture line will be included in the acetabulum. If we remember this, even if union is not consolidated, the classical deformities with their grave functional disability will not be encountered. In fractures of the upper third of the femur the proximal end is flexed and abducted, and the distal end is drawn upwards by the adductors. In such fractures, therefore, the limb should be extended and abducted. In fractures of the middle third there is often an obliteration of the normal convex curve which, if uncorrected, will give rise to a genu recurvatum. In the lower third of the femur we must guard against the prevalent sagging due to the action of the gastrocnemius which, if uncorrected, leaves a hyper-extended lower limb below the seat of fracture. Again, in the tibia we have characteristic deformities. In the upper third adduction of the lower fragment gives rise to a high bow leg, while obliteration of the normal tibial curve in fractures of the

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skeletal traction is not essential. In two military hospitals during the war over 300 fractures of the femur were treated without skeletal traction, and the average shortening, despite war wounds, was about half an inch. Efficient extension rapidly corrects any muscular spasm, and this is especially the case in fixed extension when the leg is pulled and the extension straps are tied to the lower end of the splint and tightened from time to time, in contrast to elastic traction exemplified by the weight and pulley—a form of extension I never use. Extension by weight and pulley is not an efficient method of attempting to control muscular spasm. It is by reflex nervous impulses induced by changes of tension in the muscle that muscular spasm is produced. A patient lying in bed with a fractured femur cannot avoid constantly changing the state of tension of the muscles of the thigh if he has a weight and pulley attached to his limb. The counterpoise is the weight of his body. Every time he tries to shift the position of his shoulders by digging his elbows into the bed he alters the tension of his muscles, calling forth a reflex spasm, not necessarily painful. When he falls asleep his muscles relax; when he is moved on a bed-pan there must be a reflex contraction of the muscles because there is a sudden change in tension.

The profession has of late been considerably influenced by the work of Bohler, who has contributed an interesting article to this number of *THE PRACTITIONER*. He has thrown the weight of his abundant experience into the conservative scale, and is as convinced as Thomas was upon the value of uninterrupted and prolonged rest in acquiring consolidation of bone. He also shows great ingenuity in effectively maintaining bones in apposition. His authoritative, dogmatic and lucid teaching must therefore hold and influence his audience. He says:

If we reduce exactly a broken joint and continuously hold it

The Modern Treatment of Accidental Injuries

By LORENZ BÖHLER, M D

Director of the Accident Hospital, Vienna

INDUSTRIAL development, in particular the growth of traffic, is the chief cause of the yearly increase in accidents to life and limb, and in consequence the treatment of injuries is assuming an ever-growing importance. Open wounds, fractures and joint injuries are the commonest accidental causes of permanent disability and invalidism.

OPEN WOUNDS

The chief danger of open wounds is the occurrence of severe progressive infections which not infrequently have a fatal issue. This, however, can be avoided in most cases if the wound is treated at the earliest possible moment, that is, within six to ten hours, by clean excision and primary suture. Excision is best carried out under local anæsthesia.

When the anæsthetic solution, e.g. novocain, is injected under the unbroken skin in the direction of the wound, a quantity escapes into the wound and floods out a certain amount of dirt. On the other hand, if the anæsthetic is applied direct to the wound itself, this dirt is often pressed deeper into the tissues. It is of importance to clean away with knife and scissors all injured and mortified tissue—not the skin alone. Next, the skin must be closed with thick sutures. With the exception of the larger nerve trunks, the deeper lying tissues should not be sutured, in order to avoid forcing any foreign body away from the periphery. Tendons should be sutured only in the case of sharp incised wounds and not when they have been injured by crushing. Tetanus anti-toxin must be given as a

caused by pain, and disappears as soon as the sensation of pain is removed. When an anæsthetic solution is



anæsthesia for fresh fractures in more than 5,000 cases

It is a much more difficult business to maintain the opposed ends in good position until the bones have knit than it is to secure good apposition. The continuous pull of the muscles and the action of gravity tend to produce recurrent malposition, especially if the fracture is splintered or diagonal, and in such cases it is impossible to maintain good apposition with wooden or metal splints, or with plaster of Paris. The best method for the prolonged setting of many fractures, especially those of the femur, is continuous traction direct on the bone with skewers, "tongs" or stretched wires. A new development consists in the use of skewers or wires passed through the bones both central and distal to the fracture and retained in position



FIG 3—Apparatus for fracture of forearm employing traction and counter-traction. A stainless steel wire is passed through both bones proximal to the wrist and through the ulna alone at the elbow

with unpadded plaster of Paris bandages. In this way correctly apposed ends are bound up directly with the plaster and subsequent slipping is eliminated. At present this procedure has been worked out for fractures of the forearm, wrist, tibia, and ankle bones, and for various dislocations of the bones of the foot.

In fracture of the forearm, for example, the *modus*

much longer than was hitherto supposed, and further that many fractures which were considered almost beyond hope of re-uniting, such as those of the neck of the femur, and of the navicular bone of the hand, may unite if immobilized for a sufficiently long period. Fractures of the navicular bone will always unite if they are immobilized in an unpadded plaster of Paris bandage and not disturbed for six weeks or longer. In about 150 fresh navicular fractures that I treated in this way I obtained bony union in every case.

As too prolonged immobilization damages the organs of movement, it would be desirable to find some means of shortening the time of bony consolidation. All chemical agents hitherto tried have given negative results, whether applied internally, subcutaneously, or injected between the fragments. On the other hand, the mechanical process of drilling holes, as indicated by Beck, has proved of value in delayed callus formation and in pseudo-arthritis.

Beck's "boring" method, applied, for example, to a pseudo-arthritis of the tibia, is carried out as follows: two points of insertion for the augur are made both proximal and distal to the fracture and through these are drilled about 30 to 40 holes which pass from one fragment to the other. This drilling brings the marrow space of both fragments into contact, and the holes fill with blood, bone detritus and marrow—that is, with material for callus formation. The most important point, however, seems to me to be that these holes open up new channels for the blood-vessels in the sclerosed bone of the fractured ends. I have employed this method in over 50 cases, and in the majority the result was successful.

If fractures are properly handled from the start, subsequent after-treatment is usually unnecessary. In order to grasp the principles of after-treatment, it is essential to realize the nature of the disabilities which may arise. These may be summed up as follows:

Non-union of the bones, distortion, shortening and twisting of the limb, stiffness or limitation of movement and pain in both adjacent and remote joints, muscular atrophy and prolonged swelling. All these conditions may cause temporary or even permanent disability as a sequel to a fracture.

The usual after-treatment consists in the application of physical methods, such as massage, active and passive movements by manipulation or by means of instruments. Electricity, galvanic or faradic, may be employed, or warmth may be applied in the form of hot air, hot baths, fomentations, diathermy and so forth.

Many surgeons commence the after-treatment when the bones have knit, while others make a start during the first days after the injury.

Such measures, however, are of no avail where the bones, once united, are shortened, twisted or deformed, and they can improve limitation of movement only when the cause has been unsuitable and over-prolonged immobilization, not where mal-apposition of the fragments in a fracture of, or near, a joint was responsible. Thus the field of physical after-treatment is a very limited one, and the obvious conclusion is that a fracture should, from the first, be set in such a way that the usual disabilities may be avoided, leaving "after-treatment" to cope with a few minor sequelæ only. To obviate, as far as possible, all untoward results from the very beginning is more important than to run the risk of costly and tedious after-treatment in the attempt to rectify errors.

Shortening and twisting can only be avoided by accurate apposition of the fragments and by maintaining them in a good position until the bones are knit. By accurate apposition and prolonged fixation of the fragments the affected limb remains free from pain, and those parts which are not fixed may be suitably induced to function. If active movements are systematically carried out no muscular atrophy or ischæmia

ensues. By raising the arm with a double right angle splint and the leg with a Braun's splint, traumatic swellings are dispersed and subsequent swelling prevented.

Ankylosis, especially in joint fractures, is best circumvented by taking the greatest pains to ensure accurate apposition, and by avoiding too early movement of the broken section of the limb, in order to obviate subsequent malposition.

Passive movements and massage are particularly harmful, since such measures can only be carried out if the firm plaster bandages are removed, thus disturbing the immobility of the limb. The result will be that fractures which were originally in mal-apposition would revert to their original state, and again in many types where the nutrient supply is poor, massage and passive movement prevent calcification and so cause a pseudo-arthritis. This is the case, for example, in fractures of the neck, of the femur, or of the navicular, also in transverse fractures of the tibia or radius.

The fear that prolonged immobilization of a section of a limb may lead to permanent stiffening is unfounded, since it is possible to work the muscles and cause them to contract powerfully without movement of the articulating surfaces. For example, although the knee is fixed in extended position the quadriceps can be powerfully contracted and the patella moved freely. If the wrist is immobilized, as in fracture of the radius, all 40 muscles of the hand can be actively exercised and the tendons of the fingers can move actively in opposition through two inches. That is, the hand can function, and the muscles will not atrophy.

On the other hand, if the wrist is not immobilized after fracture of the radius, there is constant pain. Movement is therefore avoided, the dorsum of the hand swells, the muscles and bones atrophy, the fragments slip from position, and there follows a permanent limitation of wrist movement.

I maintain, therefore, the following somewhat paradoxical thesis :

If a fractured articulation is accurately set and is maintained in undisturbed immobility until the bone has knitted, while at the same time the broken limb is actively exercised, a freely movable joint is obtained, on the other hand, if massage and passive movement is applied from the first day of the injury, the result is ankylosis.

I thus consider massage and passive movement in the early stages to be very harmful, because this treatment necessitates the undoing of the immobilization, so that well apposed fragments slip out of position. Further, passive movement and massage can be carried out only once or twice for a quarter of an hour per day. There are 96 "quarters of an hour" in the 24. As against that, when the limb is immobilized, the fingers can be actively exercised for hours on end. Yet when muscular atrophy, swelling and limitation of joint movement persists *after* knitting of the bones, then (but not till then) light massage and passive movement can be of valuable aid.

The question of the patient's age must here be stressed. In those under 20 years of age, provided the joint itself is not destroyed, permanent limitation of movement never occurs, even if the joint has been set *maladroitly*, and the usual after-treatment measures omitted. That is, if with massage and passive movement we obtain complete function in the joint of an adolescent, this success cannot be ascribed so much to the after-treatment as to the fact that we cannot, whatever method we employ, cause permanent ankylosis in a youthful joint, provided it has not been destroyed or become infected. With old people the matter is very different—a short immobilization in an unsuitable position (e.g. flexion of the hand) may lead to permanent disability.

the wound some antiseptic. As to these, we must remember that proper mechanical cleansing is the basic preliminary, and we cannot rely solely on any vaunted antiseptic despite propaganda, colourful appearance or clever advertising. Abundant experience has shown that any antiseptic capable of killing organisms *in vivo* also kills the tissues, and thereby renders inert the very inherent qualities we seek to promote and protect. In every age there has been a grand hurrah as to some "new antiseptic" guaranteed to solve this problem of wound infection. Just now we are passing through a phase in which gaudy colours are the vogue, and we are importuned gaily to paint or daub our wounds because the present style of organisms prefer more sombre shades than did their predecessors. This is chromatic rather than traumatic surgery, and has no real nor lasting basis.

(c) Drainage is important in accidental wounds, and gauze should not be used because it soon acts as a plug. Taxidermy is not good surgery.

(d) Delayed or primo-secondary suturing is a safety-first principle which should be more diligently practised, especially in stripping-up or contused lacerated wounds. Hence, after cleansing, we place but do not tie the sutures until the end of the second or third day, in the interval covering the wound with a gauze dressing soaked in some proven antiseptic. Our personal routine choice is one dram of the tincture of iodine to one pint of normal saline solution (referred to as "I S solution"). Probably sterile gauze would do just as well if the wound has been properly cleansed, the blood clot removed and the frayed edges excised.

(e) Tetanus antitoxin should be used whenever soil contamination so indicates, and in all gunshot wounds. If given slowly in saline solution dilution there will be little anaphylactic reaction. Combined sera, such as anti-tetanic and anti-gas-gangrene, are as yet insufficiently standardized to enter the precept class.

posture and exercises, every effort is made to prevent their occurrence, notably in such regions as the neck, axilla, bowel, groin and knee

(e) Forcing fluids, especially in children, is an important element of treatment

(f) Skin grafting and plastics should be early rather than late phases of treatment when the circumstances permit.

(3) FRACTURES

(a) Bones are the shaped equivalent of soft parts, rendered thus by calcium

(b) A fracture is a wound of bone, and as in other wounds there are two general groups or types. A type I fracture is one in which the bone edges are not end to end due to overlapping. A type II fracture is one in which the bone edges are end to end and there is no overlapping. Either of these may be simple (closed) or compound (open), and the direction of the fracture lines may be transverse, oblique or alphabetical. Obviously a type I fracture corresponds to a lacerated and a type II fracture to an incised wound.

(c) The essential object in treatment is to convert a type I (overlapping) into a type II (non-overlapping) fracture, in other words, our side-to-side anastomosis is to be converted into an end-to-end anastomosis.

(d) Traction and manipulation are the essentials and there are only two available methods at our disposal, one is manual, the other mechanical.

(e) Early reduction means easy reduction, and if we realign within the first few hours we are treating the fracture alone, if thereafter, we are treating the fracture plus complications.

(f) "Secondary swelling" is an index of circulatory stasis due more often to delay than to the original trauma, hence it is not a necessary but an avoidable evil.

(g) Provisional traction is always applicable, and

we should adopt some simple means of providing same during the waiting period between our first visit and the time of definitive setting. This means that in the hospital or the home we should at once attach to the ankle (Fig. 1) or the wrist some traction device that will effectively prevent muscular contraction during an enforced waiting period. A sheet or towel fastened to the ankle or wrist is a simple device, and if now the limb is placed on a pillow and the foot of the bed elevated, it only remains to attached a weight to the sheet or towel, and thus we have applied the principle of traction and counter-traction. In hospital,



FIG. 1—Improvised traction about ankle for fracture of the lower extremity

a boot or garter, adhesive straps or a glued sock may be substituted; but the point is that *some* sort of traction is applicable even amid the most desolate or destitute surroundings. Over-night traction of this sort will usually convert a type I (overlapping) into a type II (non-overlapping) fracture.

(h) X-ray examination should be used more for the purpose of proving the success of setting than for the purpose of proving the success of diagnosis. We are rapidly losing our special sense organs from disuse, and assuredly by inspection and palpation we should be able to diagnose a bony from a non-bony enlargement in the vast majority of injuries. Prior to 1895,

X-ray diagnosis was unknown, and yet our predecessors did a pretty good job in the average fracture, even though automobiles and aviation have introduced a much more varied type of traumapathy.

(i) In any recent joint injury associated with deformity and disability, suspect fracture and not dislocation in 80 per cent., the shoulder alone excepted.

(j) In a type I (overlapping) fracture the diagnosis is made by the sense of sight almost invariably, the presence of bony deformity being the main feature. Dislocation should be the only confusing factor.

(k) In a type II (non-overlapping) fracture the diagnosis is made by the sense of touch almost invariably, the absence of bony deformity being the main factor. Contusion-sprain is to be differentiated, and in this the pain is anywhere and everywhere; in a non-displaced fracture it is just there and right there. In a type II fracture it is focal and local; in a contusion-sprain it is general and vocal.

(l) In the fracture lexicon there are four R's on the road to fracture knowledge, and these are.

(1) Recognition or diagnosis, (2) Reduction or setting, (3) Retention or Splinting, (4) Refunctioning or rehabilitating.

(m) Splints should be safe and they should be simple, and no splint however elaborate can do more than hold the fracture in position; hence it is supreme folly to apply permanent splintage before resorting to setting. Every splint should fit the patient, and not the patient the splint.

(n) Moulded two-piece plaster of Paris splints have a very wide range of usefulness, and should be more often employed. They enhance circulation, they are removable for inspection and physiotherapy, they are custom made, they can be used from start to finish.

(o) Walking calipers (leg irons) permit earlier ambulation and shorten the crutch-bearing and disability period.

(p) Splints are removed in part when the stage of firm (lead pipe) union is reached, and they are discarded when the stage of solid (iron pipe) union is reached. This means that the calendar is not the index, but that the condition of the callus repair is the proper guide, realizing that nature's concrete (callus) is a variable factor as to production and as to consolidation. Splints should not be used indefinitely, otherwise it takes as long to recover from the treatment as from the fracture.

(q) Usage is permitted when certain "tests" produce no reaction in terms of prolonged pain, heat, swelling or redness. Forcible massage and resistive exercises are the essence of these "tests," and here again the condition and not the calendar is the best guide.

(r) Rehabilitation by massage, motion and exercises should be a coincident and not a late phase of treatment; hence physiotherapy should not be a phase of "after-care" but in reality a part of concurrent care.

(s) Compound fractures should very rarely be treated by primary suture, but on the contrary primo-secondary or delayed suture (as described above for "wounds") should be practically routine.

(t) The use of metallic suture material in fracture surgery, should be reserved for selected cases under selected auspices, and indeed bone surgery, like soft part surgery, has already entered the stage where non-absorbable material is rarely necessary or advisable.

(4) JOINT INJURIES

In all of these, early rather than late motion best promotes recovery. Hence the attack is mobilization rather than immobilization; open warfare rather than trench warfare.

Sprains —At the outset, alternate soaks of hot and cold water followed by massage and suitable strapping (Fig. 2) and immediate usage, often permit the patient to resume the usual occupation at once. the inter-

mediate or late stage, the use of hot soap suds compresses, followed by massage with warm camphorated oil, followed by exposure to the heat and light rays from electric bulbs is an excellent procedure. This is so routine with us in joint, muscle and tendon injuries that we refer to it as "SOL": S for soap, O for oil and L for light, each act of the triad to be used for ten minutes twice daily or oftener.

Synovitis—We believe in immediate aspiration, thereafter continuing the treatment as for a sprain.

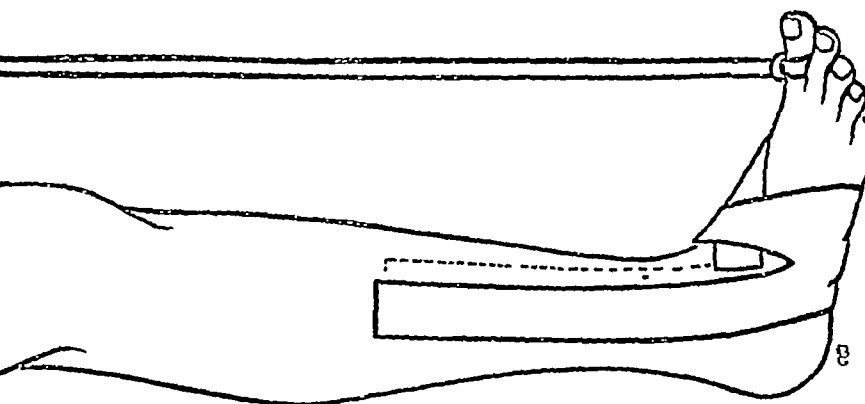


FIG 2—Ankle sprain the "split" adhesive plaster strapping

In the knee we visualize the joint as the face of a clock (Fig 3), the XII mark on top centre, the VI mark at bottom centre. To aspirate, we paint the joint with iodine at the outer margin and then use a local anæsthetic over an area about one inch in diameter. In the right knee we enter the aspirating needle (with a calibre the size of the lead in a pencil) at IX, and pass to XII. In the left knee we pass from III to XII. After all the available fluid is withdrawn (and it is usually blood) we seal the puncture with sterile adhesive or collodion and strap the articulation with adhesive, purposely not encircling completely lest circulation is interfered with. Thereafter walking is permitted, and daily use of the "SOL" treatment is prescribed. In football injuries and the like, we have

found this method exceptionally efficient. Recurrent synovitis, especially from indirect violence, is often an index of intrinsic involvement, such as cartilage injury or some other form of joint calculus (fat pads, hypertrophied synovial tabs or osteochondritis dissecans, for example) Obviously such a repeated

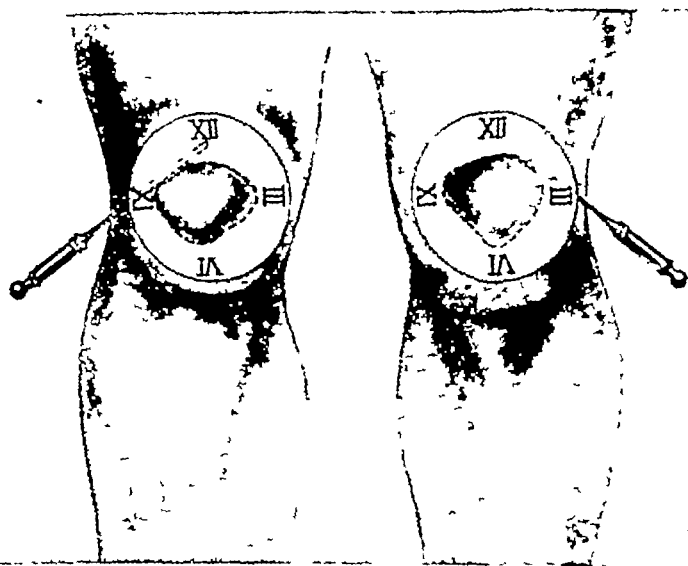


FIG 3—Synovitis of knee the face-of-the clock method of aspiration

sequence may require arthrotomy, and for this we prefer a medio-lateral large incision rather than a small sub-patellar incision

Dislocations—As in fractures, early replacement means easy replacement and hence immediate treatment should be given. If for any reason this is inadvisable or inappropriate, provisional traction is a feature of value just as it is in fractures. Immobilization should not cause constriction, for after the dislocation is reduced, we are in effect treating a residual arthro-synovitis and capsule laceration.

The Treatment of Open Fractures

By ERNEST W HEY GROVES, M S, F R C S

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Surgeon to the Bristol General Hospital*

THE need for carrying out team-work in the treatment of fractures becomes more urgent every day. It was the perfecting of team-work in the war which made it possible to reduce the mortality of gunshot fractures of the femur from 80 to 10 per cent. It is the lack of team-work in the civil hospitals of England which accounts for the high proportion of civil accidents which end in loss of limb or of function. By team-work in fracture treatment I mean the creation of special hospitals or special departments where all difficult cases may be sent and where surgeon, assistant surgeon and nursing staff may all concentrate upon this subject and create a high ideal of practice and a high standard of teaching.

At present fractures are admitted but not wanted in the wards of surgeons who are mainly concerned in abdominal surgery. Such cases are often inadequately treated and then sent out to some other institution for recovery. There is now, I believe, a great opportunity in the reorganization of our municipal hospitals for the creation of good fracture departments, which, if staffed by keen men, might raise the whole subject to the importance it deserves. There is urgent need of some wise and impartial authority to advise the Health Ministry in this matter. It is true that the 1929 Act legalized the full co-operation of the voluntary and municipal hospitals, but it needs something more powerful than benevolent permission to break down the barrier between these two classes of hospitals. It should be possible for every county and municipality to have one first-rate fracture centre to which bad and

difficult fracture cases could be sent for special study and treatment. Probably the ideal plan would be for such centres to be organized by the Universities. It is quite contrary to our national ideas of independence for any compulsion to be used about the segregation of difficult fractures. But it would be an immense step in advance if every University or teaching hospital could provide one first-rate fracture treatment centre, both for the good of the community and for the advancement of knowledge. If this were done, the suitable cases would very quickly be sent there.

The treatment of open infected fractures—In this subject we are at the disadvantage of having little or no assistance from experimental work, but on the other hand we have all the teaching of the war. It is a comparatively new subject, since it is only subsequent to the discovery of the nature and treatment of wound infection, that conservative as opposed to amputation treatment has been possible. While it is not desirable to attempt any critical review of the war work in relation to infected gunshot fractures, it is necessary to refer to the cardinal facts which emerge from this welter of blood and pus, because the rising generation will soon have forgotten those things which we only learned by bitter experience and disappointment. These cardinal facts may be grouped under three headings—namely, the time factor, immobilization, and wound disinfection.

The time factor—Severely infected wounds can only be radically treated with any chance of success if efficient operative cleansing is undertaken within a few hours of the injury. Probably six hours and certainly not more than twelve hours represent the longest time which may elapse between the receipt of the injury and any chance of effective primary cleansing of the tissues. And this time factor will be modified according to the severity of the wound, the degree of infection and the efficiency of primary immobilization.

Thus a very short time can be allowed for a wound of a penetrating character with no natural drainage, for one heavily charged with dirt and foreign débris, especially if there is much comminution of the bone. And what is most important from a practical point of view, the urgency of the time factor is much greater if the limb is left unsupported and unfixed. On the other hand, if the wound is of an open superficial character, the infection slight and the limb securely fixed from the first, then a much longer time may elapse before the chance of primary sterilization of the wound is lost. These practical points taught by the war are to be applied to the infected fractures of civil life. The necessity of thorough wound toilette is a very urgent one and demands instant action just as much as a perforated gastric ulcer or intestinal obstruction. If the accident occurs in a remote place the efficient temporary immobilization is of vital importance for transport. To carry a man on a stretcher, when he has an infected shattered limb, which is allowed to roll about, ensures that the infective agent will be rubbed into the tissues at every jolt.

Immobilization —The limb must be securely fixed from first to last. Before disinfection it must be fixed in order to prevent the dissemination of the infective agent, after disinfection it must be fixed to allow smooth healing both of bone and soft parts. Before wound treatment, splint fixation ought to be a very simple problem. It is merely to keep the limb from moving during transport. But even in this simple affair it is easy to go wrong. The only effective fixation is that which acts by maintaining traction on the wounded limb. In the very first act of handling the patient the limb should be pulled upon as it is lifted. It should then be placed in a 'Thomas' splint without removing the clothing. By some simple device fixed to the hand or the boot the limb is tied to the lower

end of the splint so as to keep all the tissues, muscles, vessels and bones in a firm tension which promotes comfort and prevents further injury. This general use of the Thomas' splint for severe arm or leg injuries ought to be taught to all Ambulance men, especially to those employed in connection with railway services. It is deplorable that in times of peace we should be taken quite unprepared in this respect by sudden railway or other industrial accidents. But this really happens with the same kind of results as occurred in the early days of the war. That is to say a railway accident occurs in a remote country district, perhaps twenty people have severe compound fractures, but these unfortunate people though quickly served with ambulance and train service often have no proper splinting applied to their limbs and by the time that they reach their destination in a city hospital, gangrene or virulent infection has occurred, which in some instances might have been prevented by the timely application of the Thomas' splint.

After the patient has been admitted to hospital the problem of the first urgency is the proper treatment and disinfection of the wound, but for the sake of simplicity I would prefer to continue the consideration of the subject of splinting, for even though the cleansing of the wound has to be done before the limb is finally put up, yet the plan for splint fixation has to be in readiness for application when the wound toilette is complete. For the early days of all bad cases some form of metal frame splint is almost essential. Of these there are many varieties, e.g. Thomas' splint used all over England and America, Braun's splint chiefly in Germany, Austria and Switzerland, and the cradle splint designed by the present writer. The actual variety of splint used is of less importance than that of familiarity with the special one employed and the rigid observance of the principle of efficient axial traction. For this, skeletal traction is by far the best

method because it is simple and efficient whilst it leaves the limb uncovered by any adhesive appliances so that the wound can be attended to without hindrance.

In a fracture of the humerus, the olecranon is transfixied whilst the arm is slung in a Thomas or Jones splint. In one of the femur, transfixion is done through the tubercle of the tibia and the limb laid upon a cradle splint with 30 to 40 lbs traction, the hip and knee being flexed. In the leg fracture the transfixion should be through the os calcis and if to avoid perforating the bone the pin is put above the heel bone it should be incorporated in a plaster of Paris shoe at the time, so as to avoid the painful lateral movements of the pin in the soft parts. The leg bones usually require about 20 lbs traction weight. The length of time during which skeletal traction should be kept up will vary according to the progress of the wound healing. But it is seldom necessary to keep it up longer than four weeks, because by that time a plaster cast can be applied even if the transfixion pin is left in place.

Wound disinfection—This is the crucial point of the treatment, although as already mentioned the time factor and proper fixation must be taken into consideration as having most important effects upon recovery. Of all the many methods of wound disinfection tried in the war, the only one that has remained in universal esteem is that of mechanical cleansing. We went through stages of doing as little as possible—leaving things to Nature and using no antiseptics, of using all the old antiseptics, including carbolic acid and corrosive sublimate, of opening up the wound and packing it with salt, of irrigating wounds day and night by hypochlorites or Dakin's solution, of packing with new antiseptics, derived from the aniline dyes, e.g. flavine. But none of these really proved to be either necessary or reliable unless used as mere adjuncts to the thorough mechanical cleansing which

the French call *débridement*.

The infected broken limb should be regarded as if it was a part of the abdominal cavity into which there has been suddenly plunged a mass of dirt and debris. Immediate and thorough opening up of the tissues right down to the remotest part which has been injured, cutting away torn and soiled skin, muscle and fascia; removal of gross dirt, foreign bodies and of bits of bone which have been separated from their soft tissue connections—these are the essential steps in mechanical cleansing. In all these respects there is a definite parallelism with the treatment of an acute abdominal infection. In the limb, irrigation will be more useful and less dangerous than in the abdomen. In both the question of drainage must be considered before the wound is closed. Only ideal conditions justify primary suture of an infected wound. In doubtful conditions the wound should be packed lightly with a flavine pack and sutures placed but not tied. Then within 48 hours, if removal of the pack shows a clean healthy wound, the sutures are tied with perhaps one or two rubber strips between some of the stitches. This method of primary or delayed primary wound suture gave great success during the later stages of the war, and the fact that it is rarely successful in industrial accidents is due to the exceptional occurrence of the special type of the latter. Also, too often, delay and temporizing methods are used or the mechanical cleansing is not made with the same care, or by the same surgical team as would set to work over a perforated gastric ulcer. So that in actual practice of civil surgery, the common type of an infected fracture that we have to deal with is the sub-acute infection in which primary wound disinfection has failed. Until recent years there were only two kinds of treatment available for such a case and both were open to grave objections. In both these methods the broken bone was kept in correct length and alignment by means of some form of traction

which would allow of constant or frequent attention to the wound. The method in common use consists in daily changing of the dressing with the use of mechanical and chemical disinfectants, e.g. peroxide of hydrogen, eusol or flavine. The other method is that of leaving small tubes in the depths of the wound and irrigating the latter at frequent intervals with Dakin's solution. Each of these methods is slow and uncertain and makes great demands on the skill and care of the nursing staff, besides being wearisome and painful to the patient. Moreover there is great danger of the traction being disturbed by the daily dressings so that only too frequently, when union and healing do at length take place, there is overlapping and angulation of the bones.

It is exactly for this common type of tedious and difficult case that the treatment introduced and practised by Winnett Orr is invaluable. It will simplify matters if this method is first described as used in an ordinary case, before discussing the principles on which it is based.

Take, for example, the common type of infected fracture of the tibia and fibula in which there is some comminution of the shaft of the tibia about the middle of its length with a wound, which has failed to heal by primary union. The skin of the leg is thoroughly cleansed by shaving and disinfection with spirit or iodine. The patient is placed on a Hawley's table and the foot, after being transfixed with a pin through the os calcis, is fixed to the foot piece of the table and screw traction applied to the leg until it is as long or longer than its fellow. Actually the final traction can be made after the wound has been opened and the bones exposed. The edges of the wound are cut away and the opening enlarged so as to give a good exposure of the bones. All granulation tissue, ragged muscle or fascia are dissected away and loose fragments of bone removed. A part of the front of the main bone

fragments is chiselled away so that a conical cavity is produced, at the bottom of which is the deepest part of the affected bone. Bleeding is arrested by gauze pressure. When this has been done, the whole wound is packed with gauze, first soaked in tincture of iodine and then with spirit. Lastly, it is packed with gauze impregnated with sterile vaseline, so that the top of



FIG 1—Open infected fracture of the tibia and fibula, two months after injury, showing overlapping of the bone

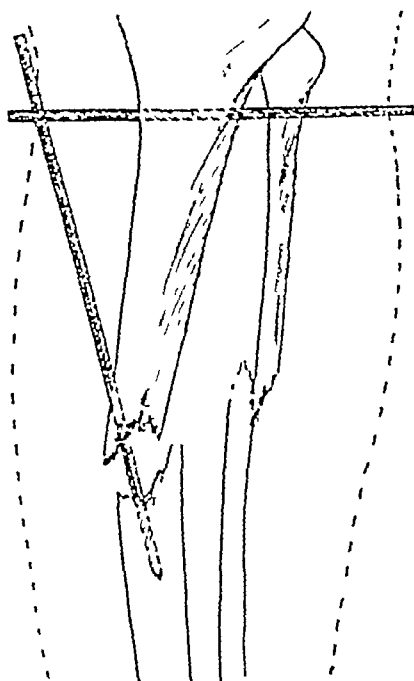


FIG 2—The same case after treatment by traction and transfixion. The tibia is transfixed above and the os calcis below (Latter not shown). A third transfixion pin goes through the broken ends of the tibia to correct lateral deviation.

the vaseline pack is level with the surface of the skin wound. No sutures of any kind are used, so that there is left a conical wound packed with vaseline. A vaseline gauze pad is placed over the wound and the whole limb is covered with gauze and wool.

In regard to the actual adjustment of the main fragments of the bone, if these by mere traction on the os calcis pin come into good position nothing

further need be done. But if lateral displacement still persists then this is corrected and good position maintained by a suitable transfixion pin going through both fragments and coming out through the front of the wound, which is then treated with iodine, spirit and vaseline, as described above. In order to maintain the bones in position if much traction has been necessary to adjust them it is best to place another



FIG 3—The same case six months later. Firm union, good alignment and full length.

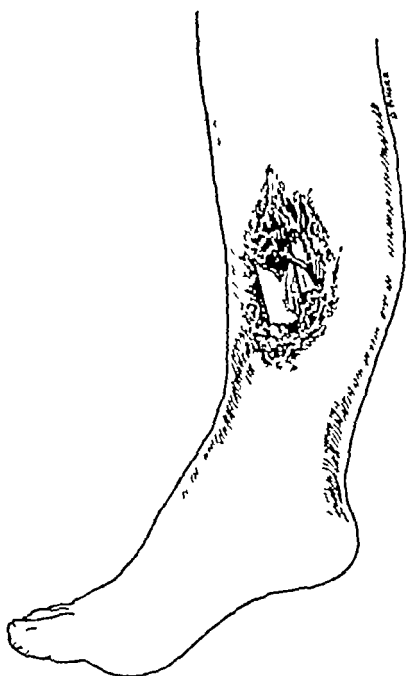


FIG 4—Appearance of the leg before treatment.

transfixion pin through the upper part of its tibial shaft. The whole leg is then cased in plaster of Paris from the lower third of the thigh to the balls of the toes, incorporating two or three transfixion pins. After the plaster has set, the patient is removed from the Hawley's table and put to bed with the leg slung in a cradle and a 10 lbs weight attached to the foot over the plaster in order to steady the limb and to

lessen the tension on the pins. *No window is cut in the plaster and no further dressing of the wound is done for several weeks.*

In an ordinary case there may be some rise of temperature between 100° and 102° F. for the first two or three days after which the temperature settles to normal. In about ten days the transfixion pin is

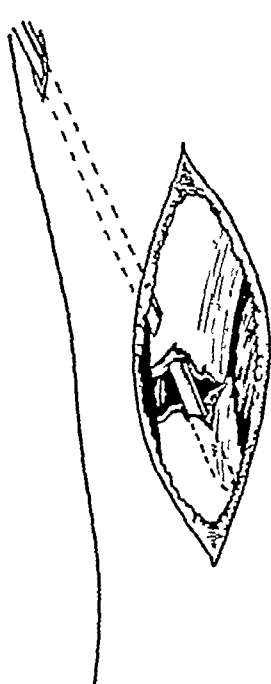


FIG 5—The tibia after removal of granulation tissue and the superficial parts of the bone, showing transfixion pins holding the fragments in alignment

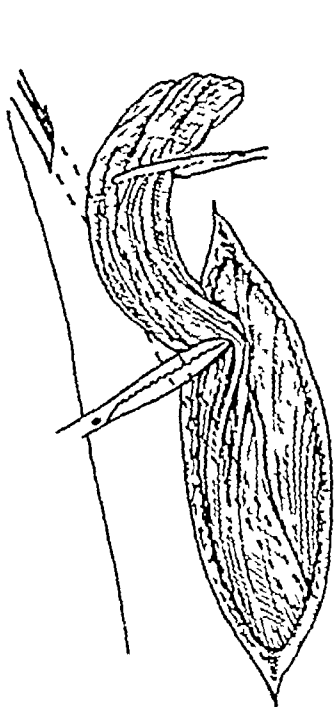


FIG 6—The wound left widely open and packed with vaseline gauze

removed from the site of fracture and in four weeks the other two pins are taken out from the upper and lower parts of the limb

A certain amount of oozing of blood occurs into the plaster directly after the operation and towards the end of the first week an unpleasant odour occurs, which remains until the plaster is removed. This is done six to eight weeks after the operation and although a

anæsthetic is not necessary, it is advisable. It will be found then that under the plaster the wound has healed in a most remarkable manner, the whole conical cavity having filled with firm granulation tissue, which has pushed the vaseline pack to the surface. The whole limb is cleaned with spirit, a new vaseline pad laid over the granulating wound and plaster is reapplied. Probably there will be good bony union, and in this case the plaster is only put on over the leg from below the knee and the patient is allowed to get about with crutches.

I must admit that this treatment and the subsequent course of the case as I have described it sounds quite incredible, and frankly I did not believe it until I saw it for myself. But having once seen it and used it repeatedly I say without hesitation that it represents a very great advance in our methods of treating infected fractures.

At any rate let us admit for the sake of argument that this course of events does really follow the treatment in the majority of cases and consider what has been gained by it. In the first place there has been secured a good union of the bone with full length and perfect alignment. There is no question of being content with a fair bone position in order to secure wound healing. In the second place the treatment after the operation is greatly simplified and the rest, comfort and recovery of the patient assured, from the fact that he is freed from the daily pain and dread of dressing. The care and nursing of the patient is changed from being tedious and difficult to being so simple that the patient can be transferred to his own home or a subsidiary hospital. But of course this transference can only be made if reliance can be placed on the doctor or nurse not to interfere with the plaster case. It must be admitted that it requires robust faith on the part of the patient and his attendants to believe that all is well with a surgical case which smells

so vile

The Winnett Orr method involves four principles : (1) Perfect fixation and immobilization ; (2) thorough mechanical and chemical disinfection , (3) perfect drainage ; (4) avoidance of wound exposure after the initial operation . It is not necessary to stress the importance of the first two points, because no one will dispute it . But the crux of the matter is that perfect fixation and immobilization with sterilization of the wound can be assured by this method more certainly and more simply than by any other, because it allows adjustment and fixation through an open exposure and then permits this to remain without fear of disturbance until the bones have had time to unite.

It is the method of drainage and the closure in plaster which at first sight seem to shock our surgical instincts or tradition . From time immemorial it has been the rule or custom to dress a septic wound daily or several times a day—and yet a moment's reflection will serve to throw doubt on the soundness of this tradition. In the first place there is the admitted failure of the daily dressing to cause rapid healing in any but a very superficial wound . Then there is the undoubted fact that however carefully dressings are done, secondary infection will always occur in the wound sooner or later . This is best seen in the treatment of conditions of chronic bone suppuration whether tuberculous or staphylococcal . No one would think of opening a psoas abscess freely, packing it and then dressing it daily, because sad experience has shown that such a method would certainly lead to secondary infection which can never be eradicated. On the other hand if a chronic abscess be aspirated and otherwise left alone it will heal, provided that the primary bone focus causing the abscess be kept at rest

The Winnett Orr method, by leaving the wound widely open and packing it with vaseline, makes it impossible for any discharge to be imprisoned in the

tissues The firm and even pressure of the vaseline pack supported by the unyielding plaster must also have a definite influence in stimulating the healthy growth of the tissues of repair

It is not claimed that this method is either of universal application or incapable of leading to failure. It is probable that occasionally the initial disinfection and drainage may be insufficient and within a few days of the operation a raised temperature, increased pain and general malaise will point to the necessity of cutting open the plaster In some cases it is probable that non-union will occur, but this is much less likely than with any other method of treatment, and if it follows the Orr treatment I believe it would have resulted in any case The method is a comparatively new one and it is certainly capable of modification and improvement Some method of ventilation and deodorization will make it much more pleasant and popular

The Radiology of Bone Injuries

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IN all cases of suspected fracture an X-ray examination is advisable and in most instances essential. Not only is such an examination carried out in order to determine the presence or absence of a fracture in doubtful cases, but information with regard to the position of the fragments, comminution, and any pathological condition of the surrounding bone, is gained thereby. The fragments may require to be set under an X-ray screen, in order to obtain the best possible apposition, and at a later stage the degree of union can be estimated by a further examination.

The majority of cottage hospitals are now equipped with X-ray installations, but since many of them are remote from large towns and the services of a radiologist, the responsibility for taking and interpreting the radiograms often devolves on a general practitioner, who has no specialized knowledge of the subject; for though the recognition of a gross fracture or dislocation is a simple matter, there are many pitfalls besetting the feet of the inexperienced and unwary in this branch of medicine, and I will therefore confine myself to the radiographic appearances of those injuries which may escape recognition, and to normal appearances which may be interpreted as abnormal by the beginner.

The first essential in the interpretation of radiograms of bone injury is a very accurate knowledge of the normal, and also of bone pathology and the processes of repair. Stereoscopic radiograms in most instances are necessary, and in every case it is essential where

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Fig 1 shows a fracture through the petrous bone. Facial bone fractures are common concomitants of motor accidents, and may be easily missed unless the mechanism of such fractures is thoroughly understood. The nasal bones are most commonly injured, and such injuries are best shown by soft lateral views. Fractures of the body of the malar bone are uncommon. Fractures of the orbital or zygomatic processes of the malar bone frequently occur, but are often missed because the only view taken is that shown in Fig. 2. This shows an opaque left antrum, with no apparent fracture. Closer inspection, however, reveals a widening of the synchondrosis between the frontal process of the malar bone and the malar process of the frontal bone, which is always an indication of fracture in one of the other processes of the malar bone. A further view taken in the position shown in Fig. 3 of the same case shows that there is a fracture of the lower orbital margin in the neighbourhood of the infra-orbital foramen, the orbital process of the malar bone being depressed backwards into the antrum, a lesion entirely concealed in Fig. 2. It is of great importance for treatment that such fractures should be detected before much callus has been formed, so that reduction of the fracture can be effected by Gillies' operation.

Fractures of the mandible are usually clinically obvious, but should be radiographed to show the position of the fragments with the relationship to neighbouring teeth, for the purpose of immobilizing the fragments by means of dental splints. Such a fracture is seen in Fig 4.

THE VERTEBRÆ

Dislocation of the cervical vertebræ is rarely seen by the radiologist. Where such a possibility is present a lateral view is usually the best perspective (Fig 5). Lateral views of the cervical vertebræ are best taken in the erect position where possible, the shoulders

pulled downwards and forwards, otherwise the seventh cervical vertebra may be missed. In the erect position with the shoulders pulled downwards and forwards, not only the seventh cervical vertebra, but the upper dorsal vertebra can also be shown on the same radiograms. A condition seen more rarely is dislocation of the dorsal vertebra (Fig 6)

Fig 7 —Crush fractures of the body usually occur in the dorsal or lumbar regions, as the result of severe injury. Fracture lines are rarely seen, but the abnormality in outline of the body and consequent angulation of the spine in its neighbourhood is the most common appearance. This may be concealed in the antero-posterior view, and a lateral view should always be made. A further distinguishing point about crush fractures of the spine is that in the antero-posterior view in such injuries one commonly sees a spreading of the body. Callus formation is usually very slight in such cases, and fractures of the lumbar vertebræ are frequently associated with fractures of the transverse processes, as in this case.

Fig 8 —Congenital non-union of a transverse process is commonly seen, usually in the first lumbar vertebra. It may or may not be bilateral, but can be distinguished from a fracture by the absence of displacement and the regularity and normal density of the approximating edges. Another possible cause of error is where the approximating edge of the psoas and the inner border of the kidney produce a linear shadow of increased density across a transverse process, simulating fracture. Closer inspection, however, will reveal that the linear shadow extends beyond the limits of the process.

Congenital abnormalities of the fifth lumbar vertebra are so numerous that many papers have been written solely on this subject. The lateral articulation between it and the sacrum may, on one side, be in the antero-posterior plane, and therefore obvious as an articula-



FIG 1 —Fracture of the right petrous bone



FIG 2 —Shows an opaque left antrum and also widening of the left fronto malar suture. Closer inspection shows a fracture of the tubercle of the left zygoma



FIG 3 —Same case as fig 2 shows fracture and backward depression of the left lower orbital margin, invisible in the other view



Fig 4 —Fractured mandible



Fig 5 —Dislocated cervical spine

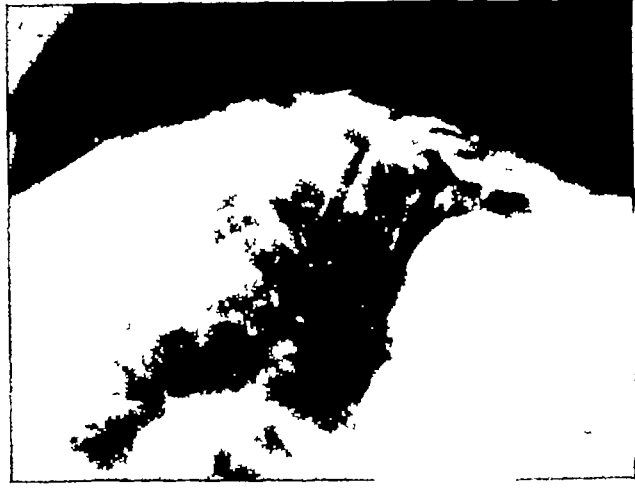


Fig 6 —Dislocated dorsal spine

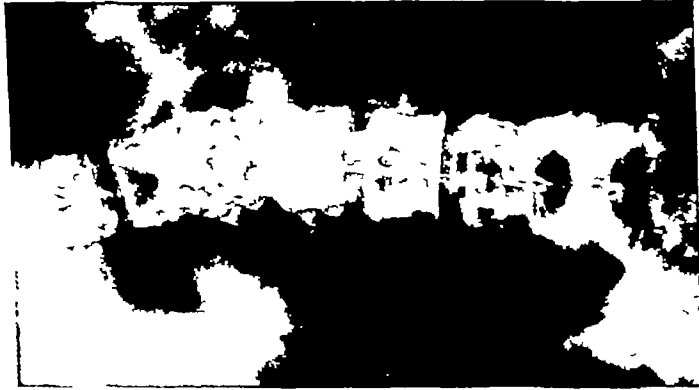


FIG 7—Crush fracture of 1st lumbar vertebra¹(taken by portable apparatus)

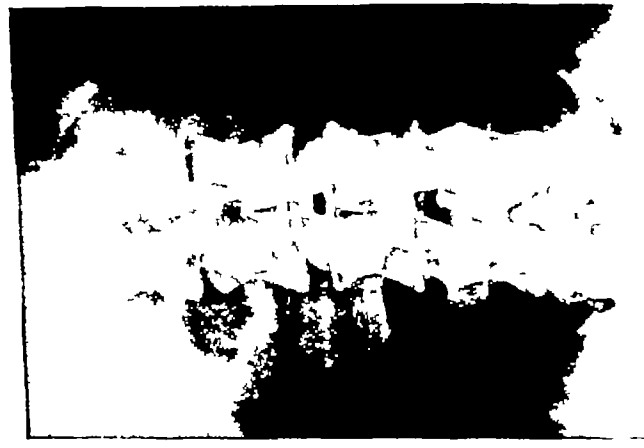


FIG 8—Congenital non union of transverse process² of 1st lumbar vertebra



FIG 9—Sacralisation of 5th lumbar vertebra



FIG 10 —Dislocation of acromio clavicular joint

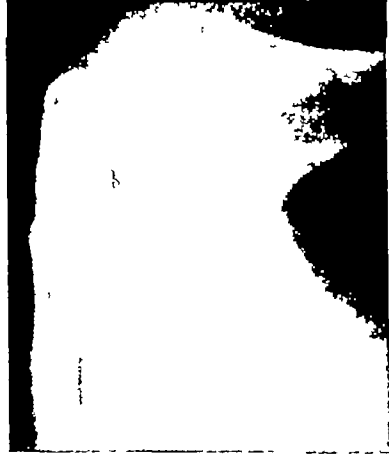


FIG 11 —Calcification in tendon of supina spinatus, sometimes mistaken for a fracture



FIG 12 —Spontaneous fracture through fibrocystic disease



FIG 15 — Dislocated humerus



FIG 14 — Pisguro fracture of the head of the radius



FIG 13 — Myositis ossificans in brachialis anticus



Fig 23 — Fractured os calcis



Fig 22 — Sesamoid bone developed in two halves

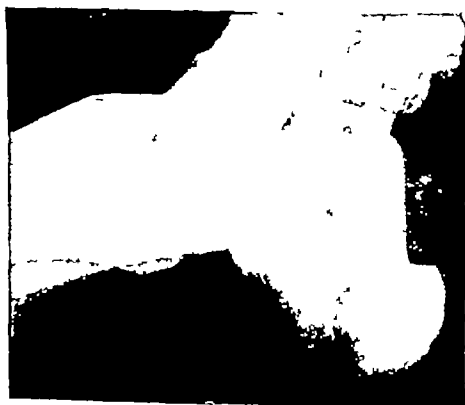


Fig 21 — Os trigonum

tion, while on the other side it may be situated obliquely so that the articulation cannot be seen. This must not be interpreted as being pathological. Incomplete fusion of the laminae, both of the fifth lumbar vertebra and of the sacrum, is common. The transverse processes of the fifth lumbar vertebra may vary widely in breadth, sometimes being so wide as to form a false joint with the upper border of the sacrum, and not infrequently being seen actually to fuse with the sacrum, this condition being known as sacrolization of the fifth lumbar vertebra (Fig. 9) shows the condition affecting the left side of the vertebra. The frequency and possibility of such abnormalities should be borne in mind when studying the radiograms in a case of a possible injury of the lower lumbar spine.

THE THORAX

Fractures of the ribs may pass unrecognized radiologically if a single radiogram in the antero-posterior projection only is taken. A fracture may be in such a position as to be tangential to the path of the rays, or it may be superimposed on the liver or heart shadow, and therefore concealed by the relative opacity of these underlying structures. In the first place, therefore, oblique as well as antero-posterior views must be taken, and in addition, where the site of injury lies over the liver or the heart, a greater degree of penetration than that used for ribs covering the lungs is necessary. The rib cartilages are non-opaque to X-rays, but they undergo progressive calcification after about forty years of age. Areas of calcification in the rib cartilages must, therefore, not be interpreted as due to injury. When looking for healed rib fractures with callus formation, it should be borne in mind that a strip of thinner bone shadow six to ten centimetres in length, running along the lower margin of the posterior halves of the ribs, is not due to callus or periostitis, but is a normal shadow caused by

sharp overhanging margins of the intercostal groove. Owing to the superimposition of the heart and spinal shadows the sternum cannot be seen in the postero-anterior view, but must be radiographed in the oblique projection to throw it clear of these shadows. A lateral view also is often useful.

THE UPPER LIMB

Tearing of the capsular ligament with dislocation of the acromio-clavicular joint is a not uncommon accident (Fig 10). The displacement of the outer end of the clavicle is upward. Abnormal areas of calcification round the shoulder joint are sometimes mistaken for fractures. Fig 11 is a case in point, showing a deposition of calcium stearate in the tendon of the supraspinatus. A further condition of this type is calcification in the subdeltoid bursa. This condition may not be visible in the usual antero-posterior view, but in suspected cases inward rotation of the arm will bring the calcified area into view. These conditions are usually symptomless, until an injury to the shoulder produces pain, generating suspicion of a fracture with consequent increased tendency to misinterpretation. The absence of any irregularity of the adjacent surface of the humerus, and of bone striation in the calcified area, should enable a correct diagnosis to be made.

In all cases of fracture the condition of the surrounding bone should be carefully examined for disease affecting the bone, such as cysts, new growth, and especially so in cases in which fracture has occurred with an apparently small amount of trauma. Fig 12 shows a fracture through fibrocystic disease in the upper end of the humerus.

When X-raying the joints of young people following an injury, particular attention should be paid to the position of the epiphyses. In cases of doubt as to the normal position, a simple check is to radiograph the opposite joint, but the radiogram must, to be comparable, be taken in exactly the same position. Myositis

ossification occasionally follows trauma. The commonest sites are the brachialis anticus and the quadriceps. Fig. 13 illustrates such a condition in the arm. Note the typical clear zone, between the calcified area and the shaft of the humerus. This clear zone disappears later, the new bone, diminished in size, appears as a projection from the shaft, the so-called "bone scar."

There are several pitfalls in the radiology of the elbow joint. Two or even more centres of ossification of the olecranon process are sometimes present. In the majority of cases this abnormality is bilateral, and in addition, the edges of the osseous centres do not show the irregular appearance of a fracture. With regard to the epiphysis for the radial head of the humerus, one should have a very exact knowledge of the normal appearance, as otherwise one is apt to diagnose a separation when no such separation exists.

Fissure fractures of the head of the radius may be missed unless carefully looked for (Fig. 14).

The commonest injury to the lower end of the radius and ulna is a Colles' fracture. Stereoscopic antero-posterior and lateral views should be taken, and the lateral view must be exactly lateral, as a very important point is to determine the degree of backward tilting of the radial fragment. In the carpus, dislocation of the semilunar, and fracture of the scaphoid are the commonest injuries. Both conditions may sometimes not be obvious to one who has no accurate knowledge of the radiological normal (Fig. 15 and Fig. 16).

Carpal bones are best seen in the postero-anterior view, if taken with the hand in full ulnar deviation. As in the foot, accessory ossicles and sesamoid bones are frequently met with in the hand, and must not be mistaken for fragments of bone separated by fracture.

It is not necessary, in such an article as this, to enumerate all the accessory ossicles which may be

found in the hand, but their possible presence should be borne in mind when a small, apparently loose piece of bone is seen in the wrist or hand. They can be distinguished by the fact that they are smooth in outline, the bone striations are normal, and there is no irregularity of the bone near which they are lying, and they are usually bilateral. Sesamoid bones are very commonly met with in the flexor tendons of the fingers.

In radiographing the phalanges and metacarpals for possible fracture, the true lateral position throws the shadows of the bones over one another. A useful additional position is that taken in the semi-pronated position, which gives a complete view of the hand, and throws the metacarpal bones and the phalanges clear of one another.

THE LOWER LIMB

When radiographing the pelvis, care must be taken to see that it is absolutely level, and that there is no tilting. In young people, a strip of bone is seen above either ilium, separated from it by a clear area about four millimetres in width. This is the normal epiphysis of the iliac crest, appearing in the fifteenth year and uniting in the twenty-second. One frequently sees in radiograms of the pelvis several small, rounded opacities on either side of the pelvic cavity. These are phleboliths, and are of no pathological importance. Fractures of the pubic bone usually show only slight displacement, and consequently may be overlooked in the radiograms if not good (Fig. 17).

A small, rounded shadow is occasionally seen to the outer side of the upper end of the acetabulum. It is frequently bilateral, but is occasionally unilateral, as in the case illustrated in Fig. 9, and is due to an uncommon accessory ossicle, and is of no pathological importance. Its smooth, rounded outline, and the absence of any irregularity of the approximating edge of the acetabulum, distinguish it from fracture.

When radiographing the hip joints, both hip joints should be taken on one film for comparative purposes, and then a further radiogram centred over the hip joint in question.

Impacted fractures of the femoral neck may sometimes be difficult to detect, especially when the line of fracture is close to the distal end of the neck (Fig 18). In cases of doubt inward rotation of the leg will bring a greater length of the neck into view

The patella is poorly seen in the antero-posterior position, better in the postero-anterior view, but best of all in the lateral or vertical projection. The latter is obtained by placing the patient on his face, the film being underneath the patella, the knee being then flexed as much as possible, and the tube inclined so that the central ray passes through the long axis of the bone. Transverse fractures are always easily seen with good radiograms, but linear fractures, and fractures above the insertion of the quadriceps, where there is little or no separation of the fragments, are more liable to escape notice. Oblique views of the patella are often useful in such cases. A rare abnormality is the presence of more than one centre of ossification of the patella, with a consequent bi- or tri-partite bone. Such a condition must not be confused with fracture. It is usually bilateral, the edges are smooth and regular, and if a further check is needed, no callus, of course, will be found a few weeks later. Very frequently an oval opacity will be seen in a lateral radiogram of a knee-joint posterior to the joint, as in Fig 19. This is not a loose fragment of bone, but is a very common sesamoid in the outer head of the gastrocnemius muscle

An oblique fracture of the lower third of the tibia is not infrequently accompanied by a fracture in the upper end of the fibula, and if a radiogram only includes the lower end of these bones and the ankle-joint, the fracture of the fibula may be overlooked. If, however, there is any appreciable degree of overlap in the tibial

fragment, it should be obvious that the fibula must also be fractured to conform with the shortening of the leg, and a further radiogram should be taken to show the site of the fracture in the fibula (Fig. 20). An uncommon abnormality is the presence of an accessory ossicle immediately posterior to the posterior process of the astragalus, and known as the *os trigonum* (Fig. 21). This has frequently been mistaken for a fracture, but its significance is easily established by radiographing the opposite foot, as it is almost invariably bilateral. As in the hand, there are many accessory ossicles occasionally seen in the foot, and sesamoid bones in the flexor tendons are extremely common. They can be distinguished by the same method as described in the radiography of the hand, and they should never be confused with possible fracture.

Sesamoid bones are sometimes developed in two halves, particularly the inner sesamoid bone in the flexor brevis tendon of the great toe (Fig. 22), and one should therefore be very cautious about diagnosing a sesamoid bone fracture, although such a fracture is a rare occurrence. The fractures show sharp edges or points, while congenital bifid bones show rounded edges. Fractures occur occasionally without any apparent trauma in the second or third metatarsal bones. The condition usually occurs in flat-footed people without any obvious trauma, and is accompanied by considerable pain. It is often a sequel to excessive marching, or violent exercise, and is termed "marching fracture." Fractures of the *os calcis* (Fig. 23) are usually caused by heavy falls on the feet.

These, then, are the possible causes of error most commonly met with in the radiology of the skeleton, in cases of presumed fracture. The radiologist should be told the clinical facts of the case, to lead to his co-operation, and to enable him to take radiograms of the part at the angle best suited to show the suspected lesion.

With regard to the processes of repair in bone injuries, it should always be borne in mind that the only two processes which are capable of being revealed radiographically in bones are bone destruction and bone production. Consequently, there may be fibrous union of a fracture, but no X-ray evidence of union until bony callus has been deposited. This does not, as a rule, take place until three weeks after the injury, and the deposition of bony callus may be delayed very much longer in old people, and also in pregnant women.

Where displacement of the fragments is slight, only a very slight amount of callus will be laid down. Where there is marked displacement of the fragments, the amount of callus will be proportionately large. It is not infrequently dangerous on purely radiographic evidence to diagnose ankylosis. Following arthrodesis of a knee-joint, for instance, a radiogram may show apparently solid bone a week or so later, extending from the femur into the tibia. This is merely due to the exact apposition of the ends of the bones, with apparent continuation of the striæ from one bone into the other. Again, it should be borne in mind in cases of possible early bone infection that the Haversian canals may be filled with pus, but yet there may be no radiological evidence at the time the X-ray is taken of osteomyelitis. This, of course, is due to the fact that though pus is present, there is at the time the radiogram is taken no actual destruction of bone, and it is only this destruction of bone which is visible on the radiogram. Such instances as this should impress on those responsible for the taking and interpretation of radiograms that the clinical evidence is pre-eminent, and should always be borne in mind, and that though radiography has revolutionized the diagnosis and treatment of fractures, it was never meant to, and never will take the place of the surgeon's ten fingers.

General Anæsthetics in Fractures and Accidents

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IN considering the question of a general anæsthetic for fractures and accidents, the cases can be divided into two categories according to the condition of the patient first, those requiring immediate operation, and secondly, those whose condition permits of surgical aid being given at leisure, and after full preparation and examinations have been carried out. It is apparent that in the first class of case the patient's condition will probably be worse than in the second, loss of blood and shock may be present in varying degrees, and the treatment of these conditions may call for more attention than the actual induction of anæsthesia. In fact, these cases resemble those met with in the war, and the general conclusions arrived at then are applicable here. Warmth and the replacing of the loss of blood are the first requirements of the patient. Gas and oxygen with a minimum of ether is generally considered to be the anæsthetic of choice, while spinal analgesia is held to be undesirable in shocked patients, on account of its liability to lower the already low blood pressure.

The choice of the anæsthetic will rest with the administrator, who will naturally incline to the method and agent with which he is most familiar. In the absence of facilities for giving gas and oxygen the older established methods of open ether, or chloroform, or a mixture, will give the anæsthesia required. If chloroform is selected, it appears that its safety is considerably enhanced by giving a small continuous

stream of oxygen with it, even when the colour of the patient is satisfactory without it. Chloroform so given is a very valuable anæsthetic. Old patients take it extremely well and with a very small amount it is possible to keep their breathing quiet and even and obtain an excellent relaxation. With open ether also a stream of oxygen assists the administration and has the advantage of diminishing the unpleasant after-effects. Perhaps there is a tendency at the present time to ignore the older methods and to forget the good results that can be obtained by their judicious use.

As an emergency method of resuscitation in loss of blood, the intravenous infusion of normal saline at body temperature should be kept in mind. Although this procedure does not possess the great advantages offered by blood transfusion and is in no way suggested as a substitute for it, it has the one great virtue of simplicity and can be carried out by a practitioner at a moment's notice, the only apparatus necessary being a hollow needle, a funnel and a piece of rubber tubing. Whilst the time taken in finding a suitable donor and making the tests and preparation necessary for a blood transfusion might cost the patient his life, the simple and rapid running into a vein of a couple of pints of warm saline might easily turn the scale in the patient's favour.

In considering the second class of patients who can be dealt with at leisure, it is obvious that the whole range of anæsthetics is open to the choice of the administrator, who again will be guided by his own personal predilections in the selection of the agent and method by which to give it.

RECENT TENDENCIES IN ANÆSTHETICS

Perhaps some reference here would not be out of place to the general state of anæsthetics, and the recent advances and tendencies noticed in this branch of medicine at the present time. The trend of all, or

nearly all of the changes that are so rapidly following one another centres round the increasing use of nitrous oxide gas. It is the limitations as well as the advantages of gas that have to such a large extent modified recent technique and led to the introduction of fresh methods. The idea of relying upon several agents rather than upon one agent for anæsthesia appears to be gaining ground. Although this has long been applied in a modified degree it is only comparatively recently that the American system of employing several agents, each contributing its quota towards the common object, has been extensively employed.

This tendency has been a gradual one and can be traced back to the time when mixtures were first introduced and gas used to aid the induction of ether in Clover's apparatus, and morphia given as a simple premedication. So highly do some surgeons appraise the value of distributing the burden of the anæsthesia between several agents that in cases of toxic goitre, for example, it is the routine for the patient to be given morphia gr $\frac{1}{6}$ or gr $\frac{1}{4}$, hyoscine gr $\frac{1}{100}$ an hour before the operation, followed by paraldehyde $\mathfrak{z}\text{iv}$ per rectum, then a local infiltration with 1 per cent novocain and gas and oxygen at the time of the operation. On the other hand, there are some surgeons who prefer less complex methods.

The advantages of gas over chloroform and ether are well known and generally admitted, but it has certain disadvantages, and it is to counter these disadvantages that so many of the recent innovations owe their origin. The fundamental difficulty of using nitrous oxide for prolonged anæsthesia has been overcome by combining oxygen with it, and controlling and adjusting the mixture of these two gases by either a sight feed, or some mechanical adaptor which delivers a definite and known quantity of the gases. It is on account of the difficulty of getting sufficient relaxation and a deep enough anæsthesia with gas and oxygen

alone that has led to the use of combining with it the action of several drugs, and more lately still to the employment of intensive pre anæsthetic medication.

The ideal of many anæsthetists of the present day is to cut down the use of chloroform and ether to a minimum and thereby avoid any toxic action which might arise from their use, and to rely as much as possible upon gas and oxygen. This ideal has been successfully attained in a large class of operations where slight relaxation is required, but in those operations where profound relaxation is essential, recourse had still to be made to chloroform or ether, so much so in fact, that the gas and oxygen played only a small part in producing the desired result. With the addition of spinal analgesia or local analgesia in suitable cases gas and oxygen could produce the required relaxation.

It is by pre-medication with one or another of a large variety of drugs, or basal anæsthetics, as they are sometimes called, that further assistance has been obtained in cutting down the ether or chloroform in many cases to vanishing point. Of the drugs given per rectum may be mentioned paraldehyde and avertin, which produce a state of sleep before the operation occasionally sufficiently deep to allow of minor surgical proceedings to be carried out without further anæsthetics, but in any case helping to avoid the use of much ether or chloroform with the gas and oxygen. The more recent introduction of derivatives of the barbituric acid group, sodium amytal, embutal, pernocton and nembutal, given either by the mouth, per rectum or intravenously, has given most striking examples of what basal anæsthetics can accomplish in correct doses and in suitable subjects and has led, to results which leave little to be desired. At present, however, there is not sufficient agreement as to the best method of administration, or of the dose of these drugs, to be able to make definite statements as to their use, but it appears likely that in time they will take

their place and prove a valuable ally to the anæsthetist

There is no doubt in my mind that all basal anæsthetics are accompanied by some risks, and at present no unanimity of opinion exists as to the best and most trustworthy of the many agents at our disposal. All appear capable of giving good results, and all require special care and experience in their administration, and also in the nursing and after-treatment of the patients. Unquestionably a great advance in general anæsthesia will be made when a basal anæsthetic, safe, pleasant to take, free from deleterious after-effects, is discovered, and it seems likely that with the many drugs now being used that this ideal is well on its way to achievement. Then the dread of the anæsthetic and the unpleasant period of waiting for the zero hour of the operation to arrive, and the first few hours following the operation will be largely obliterated.

Those who have not the opportunity or facilities, or who do not care to use the more recently introduced basal anæsthetics, may do much to make pleasanter the administration of ether or chloroform. When using open ether the induction can be made so much more comfortable for the patient if it is induced by gas first. This can easily be effected with the ordinary gas-bag and face-piece. The patient is got under with the gas till stertor is heard when the gas-bag is rapidly put aside and the open ether mask, soaked in ether, substituted. With a little practice this method can be made to work smoothly, the patient has no knowledge of the change-over, is quickly unconscious, and is spared the penetrating smell of the ether and the choking sensations which are often present when ether alone is used from the first.

Again, if no gas is available and unquestionably it is a heavy and cumbersome apparatus always to carry with one, a tube of ethyl chloride, preferably a brand which combines eau-de-Cologne with it, will serve as

on the trolley before giving the injection. Unfortunately this technique is too often completely ruined by well-meaning friends coming in to have a cheery last word with the patients, or by nurses changing the patients' clothes or even expecting them to walk to the theatre.

Carried out properly with the co-operation of the nursing staff this simple method will often give most excellent results, the patient will tell you afterwards that he has no recollection of any event after the injection, and will sleep for several hours following the operation. It will be necessary to have the most careful supervision kept on the patient afterwards to see that no obstruction occurs to the respiration, and it is as well only to employ this premedication when complete trust can be placed in those who are in charge afterwards.

Turning to new methods of technique which have recently been suggested, that described by I. W. Magill¹ has proved of great value. It consists of the passage of a wide bore soft rubber tube through the nostril directly into the larynx. For operations upon the mouth, face, neck and the head this procedure has greatly assisted the anaesthetist. It claims advantages over the intratracheal as usually employed, in that the tube is simple to pass, and in the majority of cases this can be done without the aid of a laryngoscope. The wide bore provides for too and fro breathing and so does away with the necessity of keeping the airway free for the expirations, and thus allows the larynx to be packed off in cases where blood is likely to run down.

If the instructions are carried out one is surprised how often the curved rubber tube enters the larynx, and at the ease with which it does so. By keeping one's ear near the top of the tube it is apparent when the larynx is approached by the intensity of the breath sounds. Then gently pushing down the tube

during an inspiration its entry between the cords can clearly be detected, if the patient is light, by a characteristic cough, and also by the volume of air entering and leaving the tube. If the tube does not readily enter the larynx slight withdrawing and rotation and then pushing down again during an inspiration will enable one to "feel" one's way into the glottis, or if that fails, slightly flexing the head may allow the tube to take the desired course.

There still remain, however, a certain number of cases in which the tube steadily refuses to enter the larynx by this method and recourse must then be had to the laryngoscope, and the tube inserted under direct vision. Once the tube is in the larynx a perfect control over the patient's air-way is assured, and by means of one or other of the valved adaptors fitting to the top of the nasal tube, the anæsthetic can be continued by gas and oxygen with or without ether, or by bubbling oxygen through either ether or chloroform.

In many cases of fracture the convalescence will be long, and the splinting or placing in plaster of limbs necessitate a lengthy period in bed. This enforced immobility may predispose towards chest complications, especially in elderly and bronchitic subjects, and may easily render the prognosis grave in an otherwise hopeful case. This complication must be kept in mind and everything done to guard against it. Administration of atropine before the operation, the adjustment of the position of the patient afterwards, early attention to any cough may all help to obtain this object.

Gas and oxygen is generally considered to be followed by less chest trouble than any other inhalation anæsthetic—a further reason why this agent should be used whenever possible. Certainly prolonged soaking with ether is undesirable.

Reference

- ¹ Magill, I W, *Brit Med Journ*, 1930, II, 817

Injuries and Fractures of the Skull

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ALTHOUGH motor accidents during 1930 show a slight decrease on previous years, there has been a slight increase in the resultant fatalities. In 156,793 accidents there was a death-rate of 7,305, and injury to 177,895 persons. This increased mortality is probably accounted for by the average increase in speed. Among these road casualties head injuries must hold a high ratio of incidence. The number of "head-on" collisions must be considerable. Any sudden arrest of momentum, with an individual in the sitting posture, demands that the head, from its weight and lack of rigid support, must be thrown forward, and is most likely to be injured under such circumstances. Unfortunately, this habit of speed is often translated into the sphere of too rapid official disposal of the victims, without any attempt being made to consult local practitioners, especially in the severe cases. An ambulance is given the impetus of the fire engine when it requires the repose of a carriage and pair. In cases of bad shock, it is better to be left and tended near the scene of accident for several hours, and observation of the arrival of such cases show that their condition is improved in direct proportion to the length of time taken by the ambulance to reach hospital.

HEAD INJURIES

There is probably no subject in which the diagnosis and treatment are more dependent on the accurate interpretation of the pathology and knowledge of the

various clinical types, nor one in which the anxieties and responsibilities of the practitioner are more severely taxed. The lay mind has, so far, not sufficiently realized the unpleasant sequels which may follow in the train of these accidents, even the most trivial. These should always be explained to the relatives or friends, in view of the compensation and litigation which invariably follow. The public is apt to focus its attention on the actual fracture, rather than the more important consequences to which it gives rise.

Physical conditions.—There are several peculiarities in the anatomical arrangement of the head which it is necessary to consider as an introduction to the subject, and no article can be complete in this respect without reference to Trotter's work.

The brain is surrounded by an inextensible capsule, the dura mater, and is contained within a rigid box, the skull. It lies in a natural bed of cerebro-spinal fluid, which bathes both its internal and outer surfaces. This fluid, secreted by choroid flexures of the lateral ventricles, passes down the narrow channels through the third and fourth ventricles, and, escaping at the base of the brain in the region of the fourth ventricle, it spreads out over the surface of the hemispheres to be absorbed into the large venous sinuses through the Pacchionian bodies. Some of this fluid also passes down through the foramen magnum to bathe the spinal cord and nerve roots. The pressure of the cerebro-spinal fluid is low and runs *pari passu* with the pressure within the larger venous sinuses. The brain itself must be regarded as a sponge permeated by three zones of pressure. A zone of high pressure imparted by the narrow arterial inlet with a pressure corresponding to that of the systolic pressure within these vessels. This pressure gradually falls as the arterial channels divide and widen out to form the capillaries, and finally reaches a low ebb as the blood

passes into the larger veins and into the capacious outlet of the venous sinuses. As the brain cannot expand, any encroachment on the intracranial space is strictly limited to the displacement of a small amount of cerebro-spinal fluid down into the cord and a small amount of blood from the veins into the sinuses. Any increment to this encroachment will cause profound disturbances to the intracranial circulation.

The forces concerned with the production of a head injury are twofold. (a) the external violence applied to the skull which is momentary, and (b) the effect of such violence on the intracranial contents. The first effect of violence is to cause deformity, i.e. the skull is flattened out and will bulge at right angles to the point of application of the force, when its limit of resilience is reached, it will crack, usually in the form of fissures running down to the base in a parallel direction to the compressing force. The moment the force has ceased to act, it will recoil and recover its normal shape. As a result of this sudden general pressure, the brain is momentarily squeezed, and, on the analogy of the sponge, after its normal capacity for encroachment has been passed, the blood-vessels are emptied and a condition of acute cerebral anæmia is established. Whereas the recovery of the skull is instantaneous, the reflow of blood and the secretion of cerebro-spinal fluid into the brain is a more gradual process and recovery is slow. These must be regarded as the changes which are intimately concerned with the production of concussion. Apart from these general effects, the brain may be bruised at the point struck, the so-called "direct contusion," or by means of a wave of repercussion against the skull diametrically opposed the so-called "polar contusion" or "contre coup." Although the dural septa tend to dissipate these forces, evidences of the path of this wave remain as small and scattered areas of contusion within the

As the result of trauma, the brain space may be encroached upon by means of such internal agencies as hæmorrhage, œdema, air, foreign bodies, and, in the later stages, sepsis. This pressure may be general or local in its effect upon the brain substance and leads to an embarrassment of the intracranial circulation. The effects of local pressure are those of cerebral disease generally, but are rarely encountered in these cases. The first effect will be the production of a zone of venous compression in the brain beneath it. Further increase in this pressure will produce, in addition, a deeper zone of venous obstruction. The tissues in this zone will be subject to a state of relative anoxæmia, and would give rise to such symptoms which are associated with cerebral irritation. Any further increase of the pressure will produce a still deeper zone of capillary compression, and the symptoms associated with such arterial anæmia are coma and paralysis.

SYMPTOMS

Concussion—Concussion may be defined as a temporary suspension of the cerebral functions following immediately on an injury and lasting a variable time with recovery in twenty-four hours. It follows directly on a sudden compression of the brain with displacement of cerebro-spinal fluid, the loss of consciousness and flaccid paralysis being due to cerebral anæmia. Recovery begins from the medullary centres upwards, usually initiated by the reflex act of vomiting, and the other cerebral functions recover more gradually. There is complete amnesia for the period of unconsciousness. It is important at this time for the patient to be under skilled and competent observation. Following concussion, there is a lucid interval, during which time the patient becomes mentally rational, but it may be so transient as to pass unnoticed, and the patient may pass directly into coma either from severe cerebral compression or damage to the bulbar centres.

Cerebral contusion —There has been a good deal of ambiguity with regard to the various clinical conditions which constitute "cerebral irritation." So, for purposes of clearer description, it is advisable to follow the classification adopted by Symonds, of major and minor contusions

Major contusion —This presents a picture of a patient who is stuporose, restless and irritable. It follows on an injury sufficient to cause concussion from which the patient recovers after a variable time, and passes into a state of stupor. He lies curled up in bed. At times he is difficult to rouse, and at other times resentful of interference, noisy, disorientated and violent. This condition may persist for weeks with alternating periods of lucidity and clouded consciousness, of which there is amnesia, a condition to be distinguished from the complete unconsciousness of coma. Lumbar puncture will reveal increased pressure, as registered by means of the spinal manometer, and blood may be present in the fluid.

Minor contusion —Minor contusion is characterized by headache, giddiness, and mental disability. This condition may arise after an injury with or without concussion, or follow as a sequel from major contusion. In the former, it follows directly or may be delayed for several weeks. Headache is generally intermittent and referred to the site of injury, although at times it may be continuous with exacerbations. It is markedly affected by posture and by alteration of posture, physical exertion and mental stress, and is often aggravated by lying down. Giddiness is similarly affected by changes of posture. Mental disability, such as defective memory, inability to concentrate and in decision may occur, and is often associated with insensibility. In either form of contusion, focal symptoms are rare and their localization is of cerebral disease generally, although they may be the origin of such conditions as permanent mental change and epilepsy.

The latter are usually of the Jacksonian type, and in the early stages may be in the nature of a passing symptom, though their later appearance is of a more serious and permanent nature. Meningitis, cerebral abscess, and chronic sub-dural hæmatoma are liable to follow head injury at a much later date.

Compression —The principal features of compression are coma and paralysis, unequal pupils, stertorous respiration, slow pulse and high blood-pressure. It indicates a progressive interference with the intracranial circulation, generally from hæmorrhage. The hæmatoma is always a local lesion and affects one part of the brain more than the rest, consequently it can give rise to clinical symptoms varying according to its situation. In the early stages, according to our pathological dicta, the symptoms will be those of irritation—venous stasis, and, later, paralytic—due to anæmia from capillary compression, and these symptoms may coexist as one part of the brain is more affected than the other. It is convenient to tabulate these symptoms, briefly, as they affect the hemispheres, mid-brain and medulla:—

	<i>Irritative</i>	<i>Paralytic</i>
<i>Hemispheres</i>	- Irritability, stupor, restlessness	Coma
<i>Motor cortex</i>	- Jacksonian fits	- Hemiplegia Hemiparesis
<i>Mid-brain</i>	- Contracted pupil	- Dilated and fixed pupil
<i>Medulla</i>	- Vomiting	-
<i>Respiration</i>	- Slow stertorous breathing	- Shallow irregular respiration
<i>Cardia</i>	- Slow pulse	- Rapid weak pulse
<i>Vasomotor</i>	- Raised blood pressure	- Falling blood pressure

Bulbar symptoms are evidence of advanced compression and are always of serious import.

Signs of fracture of the base of the skull.—For clinical purposes it is convenient to classify fractures into those of the anterior, middle and posterior fossæ, and correlate with each of them the signs of fracture, which are —(1) escape of blood, (2) escape of cerebro-spinal

fluid and brain matter; (3) injury to nerves; (4) infective conditions.

Symptoms—The main symptoms are as follows:—
Anterior fossa Escape of blood and cerebro-spinal fluid into the nose, which escapes externally or is swallowed, bleeding into the orbit causing bruising of the lids—"black-eye," sub-conjunctival hæmorrhages and proptosis. The olfactory and optic nerves are both liable to injury. Infective complications, meningitis or abscess may follow, whether the frontal sinus is involved or not. *Middle fossa* Leakage of blood and cerebro-spinal fluid into the mouth and through the external auditory meatus. The sixth and seventh nerves are commonly injured, and to a lesser degree the eighth. Otitis media is apt to follow rupture of the tympanum, and sepsis may spread through the fracture giving rise to extradural abscess, meningitis and cerebral abscess or sinus thrombosis. *Posterior fossa* Leakage and bruising under the muscles of the back of the neck. Injury to the seventh and eighth nerves, but the ninth, tenth, eleventh, and twelfth are very rarely involved. Infection is uncommon.

TREATMENT

The surgical treatment of head injuries, apart from the early disinfection and excision of compound injuries for limitation of the spread of sepsis, concerns mainly to the relief of intracranial tension from whatever source. All cases should be put to bed at once under expert nursing after thorough and repeated neurological examination.

Concussion—In a case of simple concussion recovery will invariably be complete within twenty-four hours. It is necessary to warn the patient, or his friends, that a period of three weeks complete rest is essential, and that the return to normal life should be gradual. The liability to subsequent headaches is often determined by the thoroughness to which this regime has been

adhered. This headache may be so severe and persistent as to necessitate decompression at a later date. Direct surgical treatment during the first twenty-four hours of concussion is called for only by the onset of coma and paralysis after a lucid interval.

Major and minor contusion.—For this condition, rest in bed, preferably in the sitting position, and sedatives are indicated. The intracerebral disturbances in these cases are due to increased tension, and the amount of this tension can be measured and controlled by the spinal manometer. Treatment should be directed to the reduction of this pressure. When it is slight, mag. sulph. daily by mouth will suffice. In severe cases the choice lies between mag sulph, 3 oz in 6 oz. of water per rectum, or hypertonic saline, 50–100 c cm. of 15 per cent. solution, administered intravenously and repeated if necessary every two days.

A more rapid effect can be produced by means of lumbar puncture, and by drawing off enough till the spinal pressure reaches normal, and repeating if necessary. When symptoms such as maniacal delirium are protracted, sub-temporal decompression, in non-localizing cases, afford a more rapid resolution of the cerebral oedema and means of escape for the surface hæmorrhage. For unrelieved contusion headache, decompression offers good help for recovery. The onset of the same symptoms after the first twenty-four hours is indicative of a late arterial hæmorrhage, or the formation of a sub-dural hæmatoma.

Compression—For compression operation is the only treatment available, and it is more successful when performed in anticipation, i.e. before compression sets in. It not only allows removal of the hæmatoma, but provides an exit for further oozing, for the ligation of any bleeding vessel, and relieves the tension produced by oedema and contusion.

Within the first twenty-four hours, concussion

obscures the true pathology, but if after partial or complete recovery from it, the patient sinks into coma or paralytic symptoms develop, arterial hæmorrhage is almost certainly present. This hæmorrhage may be extradural, subdural, intracerebral or intraventricular, and it may gravitate below the tentorium or it may be bilateral. Extradural hæmorrhage is nearly always in the middle fossa from laceration of the middle meningeal artery, and is more likely to be associated with a well-marked lucid interval following concussion. Of the others, subdural hæmorrhage is the commonest, the lucid interval is usually of shorter duration, and irritative symptoms predominate. Blood may be recovered in the spinal fluid. Intracerebral, intraventricular and bulbar hæmorrhage are always of serious import.

Where the symptoms are not localizable, subtemporal decompression is the operation of choice, but in the case of gross injury with no local signs and evidence of bulbar involvement, subtentorial decompression should be performed.

Where there are definite localizing signs, such as, for instance, Jacksonian fits, decompression should be performed over that particular area. As a rule, it is better to remove the bone in such cases rather than perform an osteoplastic flap. In all local lesions with depressed fracture operation is necessary. As most of these cases are infected, the wound should be disinfected and the dura incised.

Chronic subdural hæmatoma, even after a trifling injury, is a late sequel of head injury, and is often mistaken for tumour. The presence of xanthochromia and fibrin in the cerebro-spinal fluid is diagnostic. It must be remembered that the hæmorrhage is often bilateral. The possibility of *sepsis* should always be considered, and its presence some distance away from the focus of infection must not be forgotten. Its prevention depends on the thorough disinfection of

the wound and accessory passages when involved in the injury. The symptoms of intracranial extension are latent, and the presence of polymorphonuclear cells in the cerebro-spinal fluid is indicative of commencing meningitis. Later, the protein content may be increased, and it is not necessary to wait for the presence of organisms. Decompression and drainage should be performed over the area, including the route of infection if originating from the middle ear or frontal sinus. Very rarely is it possible to remove a chronic thick-walled abscess intact.

ILLUSTRATIVE CASES

Middle meningeal hæmorrhage—T.F., aged 20, crashed into a standing vehicle while riding a motor cycle. He was concussed, recovered consciousness during the same day, and then lapsed into periods of unconsciousness of varying intensity. Pulse rate 50, Respiration 18, Temperature 100.4°. There was hæmorrhage into the left orbit, incontinence, aphasia, and frequent involuntary movements of the right arm and leg. The left pupil was larger than the right, and both reacted to light. Five days later a small left frontal temporal osteoplastic flap was turned down and a large extradural clot removed from the temporal fossa. In fourteen days there was complete recovery. The X-ray showed a fracture of the left frontal region above the orbit.

Sub-dural hæmatoma—E.T.D., a plethoric man of 50, with an alcoholic history, sustained a trivial injury to the head four months previously. Ten weeks after this injury there was a gradual onset of headache, which culminated in excruciating pain. At this time his pulse rate was 60, the abdominal reflex was absent, the knee jerk was increased, and Babinski's sign was present on the right side. The discs showed slight venous engorgement. A diagnosis of left frontal tumour was suggested. A wide left temporal decompression revealed a large old green sub arachnoid hæmatoma, extending over most of the hemisphere with a recent clot the size of a golf ball in the Sylvian region. This was removed, and the patient's condition did not warrant exploration of the opposite side, where a similar green clot was revealed at the autopsy.

Delayed sepsis, injury without fracture—H.F., aged 19, a week after his return to school from measles, fainted and fell, sustaining a cut over the right eyebrow. Eleven days after, his condition became worse, the wound was inflamed, and his upper lid was incised and drained. His mental condition became dull, he was incontinent, and spasms of uncontrollable twitchings developed in the left arm and leg. Slight left-sided facial paresis and Babinski's sign on the left side were present. Cerebro-spinal fluid was normal. Pulse rate 104, Respiration 26, Temperature 104°. A small area of bone

was removed from the right side, and, on incising the dura, thick flaky pus was seen extending up from the anterior fossa. In the region of the arm centre there was a small collection of thinner pus, which was bulging the dura, and this was removed by suction and a small drain put in. After operation, there was acute delirium, echolalia and verbigeration. The organism was found to be a hæmolytic streptococcus, and anti-scarlet fever streptococcal serum was administered. At the end of a week, the temperature was normal, and the patient a year later is in excellent health.

Delayed sepsis with fracture, communication with frontal sinus —
A A, aged 26, crashed into a lorry while riding a motor cycle, and sustained a depressed fracture of his left orbit. One month after, he developed general signs of meningismus, and the cerebro spinal fluid showed the presence of pus cells, and no organisms were seen. The frontal bone over his orbit, which had several depressed fragments, one of which communicated with the frontal sinus, was removed. On incising the dura, sero-pus was found covering the frontal lobe, which was removed by suction. The patient made an excellent recovery.

Fractures of the Skull in Children

By CECIL P G WAKELEY, FRCS, FRSE

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AS a whole the prognosis in fractures of the skull occurring in children is more favourable than it is in adults. In very young children under the age of two years the prognosis is not good, since the venous sinuses situated inside the skull are liable to be lacerated. Should such a case not terminate fatally, there is considerable danger of some consequent spastic paralysis. From the age of two until twelve the prognosis is good, since fractures of the vault of the skull do not usually extend into the base. Further, there is less likelihood of hæmorrhage from the meningeal vessels, as, the inner table of the skull not being fully formed in young children, these vessels are not enclosed in osseous canals.

The prognosis and mortality in fractures of the skull in children depend almost entirely on the question of associated injury to the intracranial contents. There are certain peculiarities in the skull of a child, which account for the better results obtained after fracture than in adult cases. The membrane bones of the vault of the skull are very elastic, consequently any trauma applied to them results in a bending, rather than a breaking. Intervening between the individual skull bones of a child is a considerable amount of cartilaginous or fibrous tissue. This structural feature limits the transmission of the disturbance caused by trauma from one area of the skull to another, and the injury thereby tends to be

localized

In children the dura mater is more adherent to the skull bones and therefore limits, to a great extent, any extradural hæmorrhage. There is very little diploë and for this reason fractures of the outer and inner tables of the skull are indistinguishable, if one table is fractured the other must necessarily be involved as well. The meningeal vessels of children are relatively very elastic, and this characteristic feature tends to arrest hæmorrhage when a vessel outside the dura mater is injured. Again, pressure due to an intracranial collection of blood is less likely to cause damage to the brain of a child than to that of an adult.

Vault fractures are the common type met with in children. They usually are linear in outline and do not tend to extend into the base. They are always the result of direct violence. Very rarely a traumatic cephalo-hydrocele may result in cases of fractures of the vault, but in these cases the amount of trauma is excessive. The condition is characterized by the formation of a fluid swelling under the scalp, which pulsates synchronously with the heart beat and has a definite impulse on any expiratory effort. It varies in size from time to time, and is sometimes partially reducible. It contains cerebro-spinal fluid, and communicates with one of the lateral ventricles.

Basal fractures are uncommon in children, and, when they do occur, are in most cases the result of such severe trauma as to cause instant death. When, however, they occur in the anterior fossa, as a result of injuries to the face or forehead, the prognosis is much more favourable.

CLINICAL SIGNS OF FRACTURES OF THE SKULL

These are generally characteristic of fractures in other situations, e.g. pain, swelling, and, occasionally, deformity, should the fracture be depressed. It must always be remembered, however, that any fracture of

the skull in children may be accompanied by certain well-known conditions, the most important of which are the following (1) Shock (2) Concussion of the brain (3) Laceration of the brain. (4) Compression of the brain. (5) Cerebral oedema

(1) *Shock* —Any fracture of the skull in children produces a considerable amount of shock, and this usually produces unconsciousness from the onset. By the time the child is examined at the hospital, or at home, the temperature is subnormal, the pulse is rapid, weak, and often irregular. The skin is cold and clammy. There is a definite fall in the systolic blood pressure, while the respiration rate is increased. The actual period during which the child suffers from shock, varies from eight to twelve hours after which time the child may gradually and progressively improve, or, on the other hand, cerebral compression or oedema may eventually ensue. If improvement takes place, the pulse rate returns to normal, the respiration rate falls, and the little patient regains consciousness.

(2) *Concussion* —This results from a contusion of the brain tissue, which generally produces a certain amount of ecchymosis or bruising of the brain. The conditions of shock and concussion so often co-exist that it may be difficult to differentiate one from the other. However, in some cases, concussion may follow a trivial head-injury, where no shock is evident. Perhaps the commonest signs of concussion in children are giddiness, headache, and vomiting. If shock is present, the unconscious state is prolonged and may last three or four days. There is incontinence, and the temperature remains subnormal. The return to consciousness may be followed by headache and nausea, and sometimes loss of memory.

(3) *Cerebral laceration* —The most characteristic sign which accompanies laceration of the brain is pyrexia and, should the motor area be involved, there may be

muscular twitchings as well. As it is impossible for the brain to be lacerated without resultant shock and concussion, the symptoms of cerebral laceration generally become manifest after the signs of shock have passed off. If the signs of concussion are present together with pyrexia, it may safely be assumed that there is some laceration of the brain, for concussion in itself is never accompanied by a rise of temperature. Generally speaking, cerebral laceration engenders irritability and mental excitement on the part of the patient to a greater degree than other lesions.

(4) *Compression of the brain* — This is most commonly due to hæmorrhage inside the skull; it is rarely due to a depressed fracture of the skull. Sometimes, however, the two coincide. As a rule the symptoms of compression become manifest when those of shock are beginning to pass off, and the systolic blood pressure is rising. As the signs of shock are passing off, the child becomes drowsy and complains of headache, probably due to the expulsion of cerebro-spinal fluid from the cranial cavity. If the compression increases, venous stasis, due to obliteration of the thin walled veins, ensues. This is manifested in the patient by restlessness and delirium. A lumbar puncture will demonstrate that the cerebro-spinal fluid is under tension. The respiration rate is increased and the pulse rate falls. If the compression continues cerebral anæmia will be produced, the pulse is slow and its tension high, respiration becomes stertorous and gradually merges into the Cheyne-Stokes type. This will be followed by coma and death, unless the compression is relieved.

(5) *Cerebral œdema* — This may be looked upon as a local congestion with swelling of the brain tissue and is consequent upon bruising due to the trauma. Accompanying this congestion is a serous effusion into the subarachnoid space. As a rule, cerebral œdema occurs at a definite interval after fracture of

the skull. This interval is often termed "lucid," because the symptoms of primary shock may have passed off and the child seems well on the way to recovery. If, however, symptoms of compression appear, the child, after a time, becomes gradually unconscious or semi-conscious.

TREATMENT

The treatment of fractures of the skull may necessitate the treatment of concussion and compression as well as of the fracture itself. It may be stated definitely that conservative treatment, in the majority of cases, will suffice. Linear fractures of the vault require no treatment, except that of the accompanying concussion. Children after concussion are liable to be extremely irritable and toss and turn about in bed. Morphia should never be given, as it depresses the respiratory centre, and the patient may again become unconscious. Generally speaking, potassium bromide and chloral per rectum will be all that is required. Hypertonic salt solution is especially valuable in these cases, it can be given per rectum or intravenously. Hypertonic sodium chloride promotes resorption of the cerebro-spinal fluid, and consequently lowers the intra-cranial pressure. Instead of sodium chloride, magnesium sulphate in a 25 per cent solution may be given per rectum, and is quite as efficacious. The administration of a hypertonic salt solution is the best means at our disposal for the treatment of head injuries, and it forms a real and definite advance in the treatment of such cases.

Lumbar puncture will also reduce intra-cranial pressure in cases of fracture of the skull. Cerebro-spinal fluid should be withdrawn slowly every three hours. In these cases it is always advisable for the amount of fluid withdrawn to be controlled by manometric readings. In children, lumbar puncture often causes considerable disturbance, and nowadays

is rarely necessary, its place having been taken by hypertonic sodium chloride

In cases of simple depressed fractures no immediate operative treatment is necessary. Shock and concussion should be treated and, two or three days after the injury, the depressed fracture should be elevated (*See Figs 1 and 2*) All depressed fractures in children



FIG 1—Depressed comminuted fracture in the fronto parietal region causing Jacksonian fits

should be operated upon within a week of the injury. If left for a longer time, there is always a liability of epilepsy ensuing at a later date

A large scalp flap is turned down exposing the fracture, and a small trephine opening made, just to one side of the depressed area. The trephine disc is removed and a dura mater separator is inserted between the bone and the dura mater. In most cases this will form quite an efficient elevator and will raise the depressed area to its normal position. As

a rule, very little bleeding accompanies this procedure. The dura mater should be examined to see if it has been damaged. The trephine disc is replaced, and the scalp wound closed with interrupted silk worm gut sutures. There is no necessity for any drainage.

Compound fractures of the vault of the skull always call for immediate treatment in order that possible

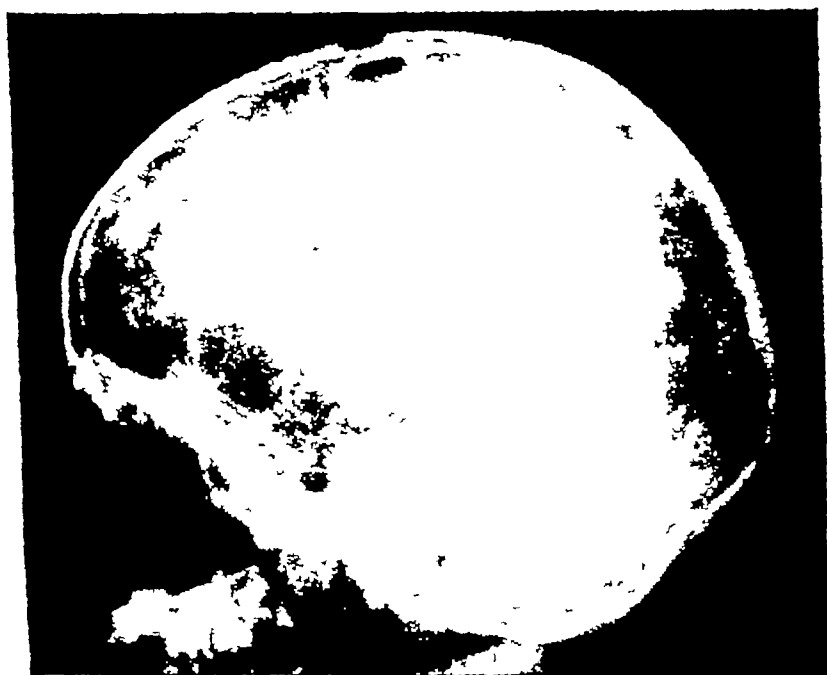


FIG 2—Skigram after trephining and elevation of the bone fragments. Child aged 8, made an uninterrupted recovery.

infection may be prevented. Any delay in dealing with these fractures may result in meningitis, extradural or cerebral abscess, or even osteomyelitis of the skull. After shaving the whole head a very thorough cleansing of the scalp is necessary. The wound edges are completely excised and any dirt or hair carefully removed. The fracture is examined and, should it prove a simple linear one, no further treatment is required. The scalp is sutured without drainage. On the other hand, if the fracture is depressed, it must

be elevated, and the dura mater examined. If the dura mater be torn, the underlying brain is carefully examined, and any blood clot or debris removed. The dura mater is drawn together by a few interrupted sutures, and a small drainage tube, reaching the dura mater, inserted. This drainage tube can usually be removed after three days. In all cases of compound fractures of the skull anti-tetanic serum should be

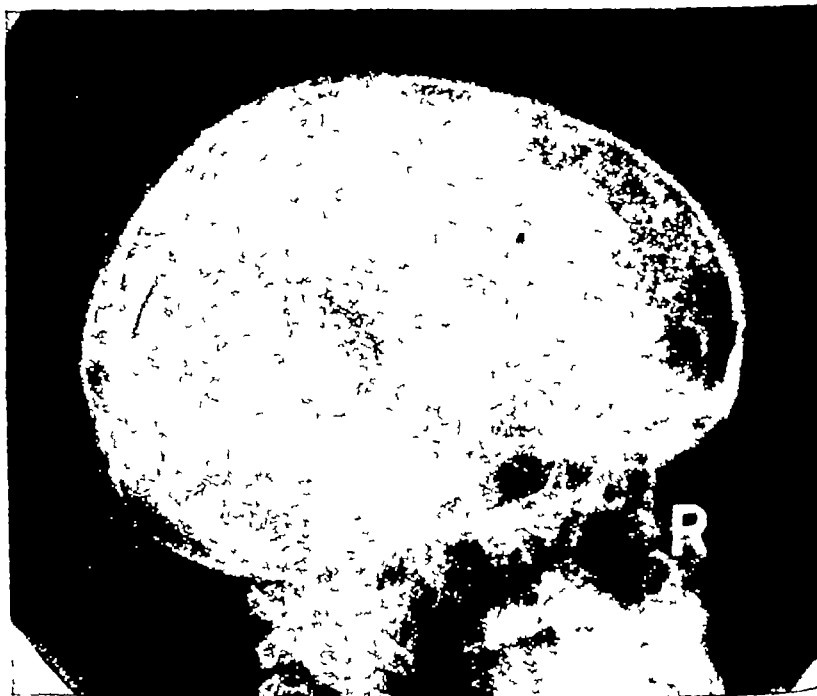


FIG 3—Skigram showing large linear fracture originating in the occipital region and passing downwards and forwards towards the base of the skull.

given. It is also advisable to give urotropin, every four hours, for several days after the operation. If this drug is given by mouth it makes its appearance in the cerebro-spinal fluid in the form of formaldehyd, and as such, helps to counteract any threatened infection of the meninges.

Fractures of the base rarely require any operative interference, unless there are signs of intra-cranial hæmorrhage or œdema, in which cases a decompression

operation is requisite.

In all cases of fracture of the skull in children it is essential to insist upon prolonged rest. This is a most important part of the after treatment, and if neglected, which is far too often the case, may be the

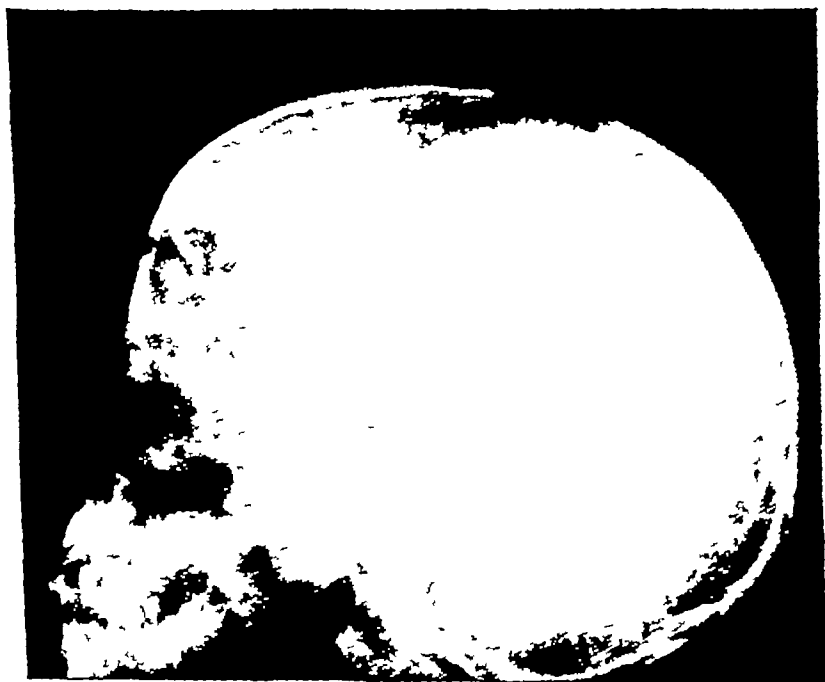


FIG 4.—Linear fracture of the frontal bone.

cause of much subsequent trouble. After fracture of the skull the mother is often far too anxious to get the child back to school, and at a much too early period. In such cases, it is the duty of the practitioner to enforce prolonged rest for a month or six weeks at least.

Injuries of the Spine

By JULIAN TAYLOR, M S , F R C S

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FRACTURE of the spine presents in a sense a more complex problem than does cranial injury, because the neurological aspect, of sole importance in the head, is accompanied in the case of the spine by what for the want of a better word may be called the orthopædic. In both injuries the neurological element is basically the same, though its evolution and manifestations are more varied in the brain owing to intricate structure. In head injuries the sole importance of fractured skull is that of a path opened for the possible passage of infection or air into the cranial cavity, while fracture of the spine is of itself a potential source of crippling disability, infection being practically limited to gun-shot wounds, now happily rare. We have therefore to consider our subject in respect of the spinal cord, its injuries and recovery, and of the vertebral column, its fractures and processes of union. An exhaustive account is obviously impossible within our limits, but a broad consideration of these aspects in the principal clinical varieties of spinal injury may assist the reader to form a basis for prognosis and treatment. The increasing diffusion of good radiography demonstrating the existence of many spinal fractures unaccompanied by cord injury, is a temptation to consider the vertebral aspects first, but the calamitous consequences of cord injury compel an orthodox beginning with the central nervous system.

ANATOMY AND MORBID ANATOMY

The spinal cord extends from the first cervical to the 1st lumbar vertebra, the whole range of spinal

nerves being given off in this length, so that in the intraspinal course of the nerve roots from above downwards there is an increasing obliquity, greatest in the region of the cauda equina. The cord is suspended in a bath of cerebro-spinal fluid in the spinal theca, which in turn lies in the protective soft and vascular extra-dural fat that intervenes between the theca and the vertebral canal. Trauma may be inflicted on the cord, on its meninges, or on the spinal nerve roots, and may result in contusion, hæmatoma, laceration, or destruction from compression. In any case the clinical consequences are those of alteration of function and the exact anatomical effect of trauma is thus a matter of deduction from physical signs. Such anatomical effects are naturally the result of pressure in some form, whether momentary, immediate and permanent, or delayed and attributable to bony changes in the process of union in the vertebral column. Further, the effects themselves may be immediate or may be delayed and due to secondary changes in the nervous elements.

The spinal nerves are clearly likely to be damaged in their intervertebral foramina, *the cord* obviously in the vertebral canal. The cord may be pressed on momentarily as the result of sudden acute flexion of the column with or without dislocation or fracture, or dislocation or fracture may so narrow the canal as to compress the theca permanently. The canal is widest in the cervical, lumbar, and sacral regions, narrowest in the thoracic, and it is in this last region that spinal cord injuries are most commonly severe. The available space, together with the various protective layers, tend to isolate the cord from displaced bone fragments, so that the dura is frequently unruptured although the cord be damaged.

PATHOLOGICAL CONSEQUENCES OF CORD INJURY

Interruption in the conductivity of the cord may

are noteworthy.

Injury above the fourth cervical segment causes death from asphyxia, all the nervous paths to the lungs being interrupted

Injury to the upper part of the cervical enlargement, i e about the level of the fourth cervical vertebra, permits the phrenic nerves to escape and thus there is seen complete flaccid quadriplegia

Injury to the lower part of the cervical enlargement, i e about the level of the fifth and sixth cervical vertebrae results in damage to segments 7 and 8 C and possibly Th 1, 5 and 6 C escaping. The consequence to the upper limbs, described by Thorburn, is the converse of bilateral Erb's palsy, as the muscles supplied by 5, 6 C are unaffected and unopposed by the paralyzed groups supplied by 7, 8 C and Th 1. The shoulders are thus held in abduction, the elbows in flexion, the forearms supinated, and there soon appears wasting of the flexors of the wrist, and of the small muscles of the hand. There may also be damage to the sympathetic outflow with resulting contraction of the pupils and narrowing of the palpebral fissures. Below the upper limbs there is a complete flaccid paralysis, and there is sensory loss up to and including the ulnar border of the arm, forearm, and hand. Respiration is carried on by the diaphragm and by the accessory muscles of the neck. There is here a mixed picture of tract effects and of those of local pressure on grey matter as evidenced by the wasting of muscles. When spasticity later appears in the lower limbs the contrast between the two varieties of nervous effect is more obvious

Injury to the thoracic region is characterized by flaccid paralysis and sensory loss below the level of trauma

Injury to the lumbar enlargement and cauda equina — These may for present purposes be considered together. Their characteristic manifestations are paralysis, atony, and wasting of the lower limb muscles, anaesthesia of

the lower limbs and buttocks, abolition of reflexes, and retention of urine

The foregoing are the effects of complete transverse lesions of the cord at different levels. Many injuries cause *incomplete lesions* though in the early days of recovery these may appear to be almost complete. It is theoretically possible for incomplete lesions to appear complete to begin with, but unfortunately it is usually found that injuries showing immediately no sign of incompleteness rarely proceed to any recovery. The fact that a lesion is incomplete and therefore has some chance of recovery, is most often shown by absence of complete sensory loss, and in general it may be said that in the cord the motor paths are the more sensitive and the earlier to lose function in response to pressure, the sensory paths the less sensitive and the longer resistant.

All degrees of loss of function are seen in incomplete injuries, from complete paralysis with partial anæsthesia, to temporary paralysis without anæsthesia lasting only a few minutes. Also as has been noted, the cord may not be injured at all, nerve roots alone suffering trauma.

Hæmatomyelia — This is an important form of injury and it may be that a severe crush, during recovery, may show that it is present by the character of the signs presented as the sensory change lessens, or it may be that during the days following a crush a progressive hæmorrhage may occur, so that the signs of hæmatomyelia may become manifest by increase, rather than by selective reduction of the signs. The characteristic sign of hæmatomyelia, analgesia and loss of temperature sense in the distribution of the affected segments, is due to the fact that such effusions of blood are most frequently central in the cord, and thus affect the pain and temperature fibres as they cross from the homolateral to the contralateral side almost immediately they enter the cord. An extensive

hæmatomyelia may also affect the pyramidal tracts

Visceral effects of spinal injuries—In the hours following the occurrence of a lumbar injury, it is not uncommon to find increasing abdominal distension. This together with the shock associated with the injury may give rise to a suspicion of the presence of visceral injury. With rising pulse rate and increasing abdominal distension, the decision as to the necessity for exploratory laparotomy may be extremely difficult.

THE CLINICAL PROGRESS OF INJURIES

It has been stated that in complete transection of the cord no recovery is possible. This is not however true of the cauda equina, peripheral regeneration being here possible. In complete injuries there is later on a resumption of reflex activities by the cord the muscles become spastic, the tendon reflexes return, the plantar responses become extensor, and cutaneous stimuli to the limbs cause movements over which the patient has no control. The muscular spasm results in fixed flexion of the hips with adduction, and flexion of the knees and ankles which eventually becomes contracture. Such flexor spasms are evidence of the presence of complete lesions and are thus of serious import. "Automatic micturition" appears with a return of reflex activity and the bladder begins to empty itself though incompletely. The beginning of these changes is usually seen during the two to three weeks following the accident.

In partial injuries the first sign of returning function is usually seen during the first two or three weeks and is commonly an increase of sensation. It often begins in the distribution of the sacral segments. Later there is return of muscular power and if the injury is a severe one there is also spasticity, but now in extension. Extensor spasms may be produced by cutaneous stimuli. In some incomplete examples evidence of the presence of hæmatomyelia may appear, i.e. dissoci-

ation of sensibility, pain and temperature appreciation being lost at the level of the lesion, usually the cervical part of the cord. All sorts of variations are seen in incomplete injuries, from a rapid and complete return to the normal in mild cases during two or three weeks, to an incomplete return of sensation without muscular power in several months. Patients whose sensation has been preserved but who fail to achieve a return of voluntary muscular power often complain of intense pain associated with involuntary muscular movements, an intractable sequel which is one of the most melancholy consequences of spinal injury and which has even necessitated operative division of the spinal cord above the lesion.

THE VERTEBRAL COLUMN

It has already been noted that injury of the cord may be seen in the absence of dislocation or fracture of the spinal column. Some of these cases may be of the nature of dislocations immediately and spontaneously reduced, others are probably simply the effects of hyperflexion of the column and are most common in the neck. Of such perhaps the most striking is the recurrent temporary quadriplegia seen in long-necked persons following sudden flexion of the suboccipital region, and due to pressure of the dens of the axis on the theca. Injuries of the spinal column are of two types, *dislocation* and *fracture*, the majority of the former being complicated by the latter. In *dislocation* the upper of two vertebræ slips forward on the lower, so that the inferior articular process of the upper comes to lie in front of, instead of behind, the superior articular process of the lower. Thus the intervertebral foramen becomes distorted and partially filled by the inferior articular process of the upper vertebra and as a consequence the emerging nerve roots may be pressed upon. The pressure on the theca may be, but is not necessarily, produced by compression between the arch of the upper

vertebra and the body of the lower. In dislocations the inferior articular process may remain balanced upon the superior articular process below and either complete or incomplete dislocation may be unilateral or bilateral. All such dislocations are seen almost exclusively in the cervical region and may of course be complicated by fracture. In unilateral cervical dislocation there appears a fixed rotation of the head towards the sound side, the head also being inclined towards the sound shoulder. In a bilateral dislocation the head is held stiffly forward. An important but rare variety of dislocation is that which occurs at the atlanto-axial joint in young children.

Fracture may occur in any part of the vertebra. Spinous and transverse processes may be fractured by direct, indirect, or purely muscular violence, and very rarely a lamina may be thrust forward into the spinal canal by direct violence. Spinous processes suffer most commonly where they are prominent in the thoracic region. Transverse processes are liable to fracture where they have no support from ribs, and where they are subject to great muscular strain, i.e. in the lumbar region, and fracture of both these processes may be associated with more serious injuries to the bodies, and with dislocation. Isolated fractures of processes are uncomplicated by cord injury and are causes of pain in the back, their nature can be elucidated by radiography.

Fractures of vertebral bodies — These are again nearly always due to hyperflexion of the vertebral column together with vertical compression, and most commonly result from the kind of accident in which a great weight falls on the subject's neck. There are several types and there may be in a given injury a number of elements in the anatomical result to the spine.

(1) *Fracture dislocation*. When the body of the upper vertebra slips forward it may take with it a part of the intervertebral disc and a wedge-shaped piece separated

from the anterior part of the upper surface of the lower vertebra. This kind of accident is perhaps commonest in the thoracic region and may be associated with fracture about the manubrio-sternal junction.

(ii) *Compression fracture* A vertebral body may be comminuted by compression without associated dislocation. Being compressed it assumes a wedge shape. This fracture is commonest in the upper lumbar and lower thoracic regions, and when unassociated with dislocations there is usually no effect on the spinal cord.

(iii) Where fractures are the result of very great violence as in many coal-pit accidents, there may be *complete disruption of the column* at the site of injury so that it may become flail-like.

Diagnosis—Physical examination will often show the nature of the injury. Reference has already been made to the displacements of the head associated with cervical dislocations. Compression-fracture and the majority of fracture-dislocations result in angulation of the vertebral column which, as in many diseases of vertebræ, produces prominence of a spinous process, and there may be also irregularity with lateral displacement of one spine on another. In assessing the importance of such signs it must be remembered that especially in the lower thoracic spine, irregularity of the palpable parts of the spinous processes may be normal, that localized limitation of movement may be hard to ascertain in any region, and that where there is a possibility of fracture, injury to the cord may perhaps be increased or actually produced by too thorough an investigation of movement.

Radiography is obviously a necessity in every spinal injury, but its discussion is the province of the radiologist and is here left in the highly expert care of Dr. Graham Hodgson, three of whose radiograms are illustrative of the injuries under discussion. In the absence of a careful physical examination and sometimes without omitting it, the detection of spinal injuries

without gross cord or nerve injury may be impossible apart from such radiological help. An example of this was encountered some years ago by the writer —

A girl aged 20 was pitched out of an overturning car, landing on her head. She suffered slightly from concussion of the brain, but recovered immediately. Returning home she found she had some stiffness of the neck, but little notice was taken of this except that a fortnight's massage was instituted. At the end of this time she was better, and well enough to be up and about, although her neck was still stiff. Her first excursion was a visit to her coiffeur, who, during the act of shampooing her head, pressed upon her occiput, flexing her cervical spine somewhat forcibly. Immediately she felt an agonizing pain in the outer part of the arm and in the forearm. Radiography showed a fracture dislocation of the fifth and sixth cervical vertebræ, and physical examination the presence of altered sensation in the distribution of the sixth cervical nerve. She could then by flexing the neck reproduce the pain initiated by the coiffeur. After partial reduction of the dislocation, followed by several months on a plaster bed, her pain had disappeared.

The exact nature of the injury having been demonstrated by the radiologist, it is for the surgeon to correlate such findings with his conclusions as regards the nervous system, and thus to attempt to elaborate a conception of the exact morbid anatomy of the injury to the column and cord.

Progress of healing in fractures of the vertebral column
—Bony union of the displaced vertebræ is the rule, and in the absence of manipulative reduction must occur more or less in the position into which the accident has thrust the damaged bones. Where there is separation of two vertebræ, as in partial dislocations, with the passage of time the upper vertebra sinks down on the lower owing to plastic accommodative changes in the articular processes and pedicles. Consolidation of spinal fractures should be so complete as to be adequate for weight bearing in about eight weeks. Where there is much comminution or displacement a considerable amount of callus may be thrown out so that compression of both emerging nerves and of the theca may be increased, or actually produced, by the process of union, an unlucky event that is likely to be aggravated

by failure to recognize the presence of fracture and consequent inappropriate treatment

Having now outlined the main facts regarding the cord and the column, we are in a position to assess the injury as a whole in any given example. The majority of cases suffer from severe shock at the onset, so that examination of their conditions must be short. The possibility of associated visceral injury must be borne in mind, and a decision on this question is more important during the early hours than on the spinal condition, because, as we shall see, there is no question of urgent operation for the latter. But when any uncertainty as to the viscera has been dispelled the patient may be gently examined as regards his spine, rolling him on to his side for this purpose perhaps, so that his spinal and neurological injuries may be determined.

There are certain fairly well-defined types of spinal injury to which reference must be made.—

(1) *Fracture-dislocation in the region of the fifth and sixth cervical vertebræ*—Bilateral dislocation is most commonly associated with a cord lesion, often incomplete. Unilateral dislocation is uncommon and less likely to be accompanied by cord effects.

(2) *Compression-fracture of the thoraco-lumbar region.*—This is usually accompanied by no nervous lesions, but when there is fracture dislocation, or more extensive fracture, *conus medullaris* or *cauda equina* lesions are often present.

(3) *Fracture-dislocation about the level of the fourth thoracic vertebra*—This is a serious injury often associated with complete paraplegia. It is also accompanied by severe shock.

(4) *Fractures of processes without encroachment on the spinal canal* (*Vide p 92*)

TREATMENT OF SPINAL INJURIES

The injury to the vertebral column.—*Dislocation*

Unilateral dislocation unaccompanied by cord pressure is susceptible of reduction. This is effected under anæsthesia by a combination of traction on the legs and head and gentle manipulation. It is important that a radiographic picture be available as associated fracture may make reduction difficult or impossible, and manipulation may then produce pressure on the cord. Attempts at reduction should be made as soon and be as gentle as possible. *Fractures* In general, the treatment of spinal fracture consists of rest in bed or perhaps on a plaster bed. With compression-fracture without cord or cauda injury, an attempt may be made to correct deformity by means of traction and hyper-extension on a frame, the comminuted vertebral body being thus relieved of compressing stress and being possibly opened out again. Such cases must be kept in a hyper-extended position until consolidation has occurred. In the average case, provided the central nervous condition permits, a patient suffering from fracture of the spine may be allowed up after eight weeks.

The injury to the cord.—In a fairly severe paraplegia the first signs of recovery are commonly the reappearance of reflex activity in the cord and return of sensation. Recovery must be watched and its progress noted so that arrest after a propitious beginning may be recognized, this being sometimes an indication for operation. The prevention of contractures from uncorrected flexor spasm is an important part of the treatment and is carried out by splints if necessary.

*Bedsore*s —The incidence of bedsores naturally varies more or less inversely with the skill of the nursing. They are especially likely to occur during the early stages of an injury before the skin has become accustomed to disconnection from the brain. It may be said that nearly all paraplegics have bedsores at some time, though these may heal with surprising facility under treatment. They are frequently absent in

caudal lesions and almost invariably present in conus medullaris injuries. Most nurses have their own infallible remedies for preventing and curing bedsores, but success depends for the most part in the protection of prominences from continuous weight-bearing, and the efficient management of the bladder and rectum. When extensive sloughing and infection occur these must be treated surgically

Bladder.—Retention of urine is most difficult to deal with. The majority of cases suffer from it at first and provided aseptic conditions are available, it is best managed by catheterizing at least twice daily with punctilious cleanliness, the bladder being completely emptied on each occasion. It is well to wash out the urethra, before passing an instrument, with some mild antiseptic such as oxycyanide of mercury 1/4000. When the bladder begins to empty itself, which in complete paraplegia should occur in about three weeks, catheterization must be continued at least once daily to ensure that the bladder is regularly and completely emptied. With the most stringent precautions it is almost impossible to avoid some urinary infection, which is the more dangerous to life from ascending infection of the kidneys, the earlier it comes on. When such infections have become chronic they are less dangerous and many patients live for many years with chronic severe urinary infections without suffering more hurt than occasional bouts of fever. Eventually, however, it is likely that with progressive destruction of the renal tissue, a fatal exacerbation with uræmia may supervene. The most resistant cases of spinal injury so far as urinary function is concerned are those of the cauda equina

Other less laborious methods of dealing with retention of urine have been employed, but all have their disadvantages. The in-dwelling catheter changed daily is perhaps the least objectionable of these, but urethritis is inevitable with consequent cystitis and ascending

infection. The emptying of the bladder by suprapubic massage is to be unequivocally condemned, owing to the ease with which the atonic bladder wall may be thus ruptured. Suprapubic drainage, ideal as it sounds for the bladder of the permanent paraplegic, is not a highly successful measure owing to consequent wetting of the bed and liability to bedsores.

Colon—The majority of paraplegics suffer at some time from constipation and abdominal distension. Constipation is no great evil as it masks incontinence of fæces and enables the nurse to open the bowel by means of an enema every other day. Distension may be hard to deal with and may necessitate the use of turpentine enemas and purges, but the production of diarrhoea is to be avoided when the anus is incontinent.

OPERATIVE TREATMENT OF CORD INJURIES

The only thing that operation can do is to relieve pressure on the cord from displaced bone or callus. Incision of the cord as an early measure for relief of tension by letting out blood clot is not to be recommended and it was noted earlier that large effusions of blood are unusual. The only possible approach to the cord at the present time is by laminectomy, and in certain cases this is indicated. It has been insisted that recovery of destroyed nervous tissues is impossible, and thus operation is not indicated for relief of pressure unless an injury be incomplete. Indications for operation may be given as follows.—

(1) An incomplete injury where the process of recovery after a propitious beginning becomes arrested, especially if lumbar puncture shows the presence of cerebrospinal fluid block (Queckenstedt phenomenon), and especially if the cauda equina be the site of injury.

(2) Where a lamina is thrust forward by direct violence and can be shown to be in such a position as to be capable of pressing on the theca. This is the only indication for an early decompressive operation, which

of course is contra-indicated by the presence of a complete lesion

(3) Operation is indicated in compound injuries and for the removal of foreign bodies

Precocious interference has been urged in the past, but such a procedure is contra-indicated by the following considerations. (a) Spinal injuries cause severe shock, and patients suffering from such recent trauma are in no condition to stand the moderately severe operation of laminectomy. (b) *Incomplete lesions suffer no permanent harm from pressure lasting as long as two months, so that time up to this period spent in deciding whether operation may or may not be necessary is not prejudicial to ultimate complete recovery* (c) *In fracture-dislocations there may be considerable damage to the anterior parts of the vertebræ concerned.* Laminectomy may remove an important element in the local stability of the vertebral column if performed with precocity, though if we wait until some consolidation has occurred, there is no such danger. This is one of the very few exceptions to the rule that laminectomy of whatever extent does not prejudice the stability of the column.

Operation is, perhaps, most often indicated in thoracolumbar fractures. It consists in laminectomy with exposure of the dura, a procedure that must be carried out with deliberation as the theca may be displaced towards the surface by the injury. All bony pressure is relieved, and if it can be demonstrated that a cerebrospinal fluid block has been thus abolished, by the appearance of pulsation previously absent from the theca below the site of injury, there is prospect of benefit accruing. It is theoretically possible to suture the nerves of the cauda equina with recovery of function, but this is rarely possible in practice. In general it is advisable to leave the dura unopened if it be thought that pressure has been relieved. Operation is also indicated apart from cord injury, and it is sometimes

advisable to remove fractured transverse and spinous processes where these are causing persistent pain. Occasionally where there is persistent pain on movement in united fracture of the column, it may be advisable to fix the injured part by grafting.

Prognosis —All degrees of neurological recovery are seen in cord injuries, and in each case there is a corresponding crippling. Where there is complete neurological recovery the spinal fracture may be the cause of severe disability, especially in the lumbar region. Thus it is common for sedentary workers to return to normal life after neurological recovery, but is almost unknown in miners and others who live by muscular work, which folk have a less happy outlook and rarely return to their original tasks. In them the final disability is commonly pain at the site of fracture, often due to osteo-arthritic changes in the injured and sometimes malunited spine.

Injuries to the Shoulder

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THE keynote to the successful treatment of all injuries of the shoulder is the prevention and treatment of limitation in movement of this joint which results from an injury. Should treatment be started without regard to this the patient will suffer loss of function longer than is necessary and the practitioner responsible will experience considerable difficulty in restoring his patient to full activity. Injury of the shoulder joint is responsible for more pain, suffering and time lost from work than almost any other type of injury which occurs.

Our principal difficulty in the treatment of these injuries lies in the steering of a course midway between movement and rest. The latter being essential to enable repair of the damaged structures to take place and the former to prevent stiffness and the formation of adhesions. The first principle, which we have to learn in the treatment of all joint injuries, is that if the patient can actively move the joint it can only be for good. The presence of a bone injury in the neighbourhood, as will be pointed out later, does not necessarily prohibit any movement of the joint itself.

Whilst passive movement has its place in the restoration of function of a joint, it is of little value in comparison with an active movement performed by the patient himself, if necessary with the assistance of a masseuse. And in shoulder injuries in particular assisted active movement is infinitely more valuable than any passive movement, which may even delay recovery. Passive movement is out of the control of the patient and therefore is apt to go beyond the point of doing good, exciting muscle spasm and

in loss of movement.

In the examination of an injury to any part of the upper limb, it is as well always to examine the shoulder and clavicle as a routine. It has been the lot of the author on several occasions to see patients who complained of trouble with the shoulder, previously unrecognized, after such an injury as a Colles' fracture.

Not only does it require a little explanation to the patient as to why this had not been noticed previously, but it also entails a very painful course of treatment for the patient to undergo before full function is restored. And should the patient happen to be of a certain age such restoration of function may never be absolute. Whilst movement in this joint may be comparatively easy to maintain should injury be recognized promptly and adequately treated, discovered several weeks afterwards it presents quite a different problem. It now requires a plucky patient and a painstaking attendant to deal with the situation.

Though simple falls on the shoulder or strains of this joint are apt to be treated lightly both by the patient and his medical attendant, they are responsible for more loss of function than many fractures. It is as well to point out that from the patient's point of view it is often limitation of the extremes of movement, i.e. the last few degrees in each direction which are responsible for the most persistent symptoms. The majority of instances of "so-called neuritis" following injury of the shoulder with pain referred down the outer side of the arm to the elbow joint and even the hand are entirely due to limitation of the extremes of movement and are not neuritis at all. This so-called neuritis clearing up at once when restoration in the movement of the shoulder joint has taken place. Besides examining movement, the presence of any effusion into the joint may be determined by swelling and tenderness on its anterior aspect.

Prevention of disability through loss of movement

should be our aim and not its cure when established. Whilst fractures in the region of this joint of course require treating, in doing so the other trouble which may arise should not be lost sight of. As in all other joints a traumatic synovitis of the shoulder joint requires a period of rest to aid in the absorption of the fluid but never a period of complete immobilization. Unlike other joints it is by reason of its structure particularly liable to get stiff. It has a voluminous capsule between whose surfaces adhesions form with the greatest of ease. The duration and degree of rest given must of necessity depend upon the severity of the injury, the degree of pain that results and the damage to the structures around the joint.

Pain may be relieved by hot bathing, radiant heat or antiphlogistine combined with gentle massage to relieve muscle spasm. In the intervals all that is necessary is the provision of a sling to support the weight of the arm. Active movements must be encouraged at the earliest possible moment.

After any injury to a joint the patient very rapidly loses the power to contract his muscles voluntarily. This is very obvious in the knee-joint and it is equally apparent in the shoulder-joint. The patient very often will appear quite unable to contract the deltoid, and in order to get over this difficulty the patient should be treated in the early stages in the recumbent position. The first thing that is necessary is to support the upper limb, for the patient without assistance is helpless, and unable to carry out any movement, let alone that against gravity. Whilst support is being given to the limb the patient may be deceived into using his muscles. The arm is gently abducted about 30° from the side and the patient then instructed to press upon the arm of the masseuse, in doing which he unconsciously puts into action all his shoulder muscles including the deltoid, and at the same time the arm can be further abducted by the

masseuse offering a resistance without exciting muscle spasm or causing pain

In this manner a very considerable range of movement is obtained, whilst simply asking the patient to move the joint on his own initiative is certain to result in failure. Having once persuaded the patient that voluntary movement, of however small a degree, can be carried out half the battle is won. It then consists of a process of encouraging the patient. There is just one very practical point to remember. The time when the patient gets most pain in this movement is not when the arm is being abducted so much as when it is being replaced at the side. For this reason the patient must himself adduct the arm whilst it is still being supported.

The personality of the masseuse treating the patient is all important, she must be able to impose her will on him with each advance encouraging to greater achievements. It is useless, in fact it is laying the seeds for future trouble, to massage the shoulder. Massage will relieve spasm and improve the circulation, but active movement by the patient is the only means of bringing about a restoration of function. This cannot be emphasized too strongly. And this is the problem with which we have to cope in one form or another after all injuries of the shoulder. Once the joint has been allowed to get stiff the problem is essentially different. Very often the patient himself does not appreciate that there is this lack of movement in the joint, for by means of scapula movement he is able to do most things and what he complains of is loss of power and neuritis. When such a condition is present before any progress can be made the adhesions which have formed and are mainly responsible for the loss of movement must be ruptured. It is probable also that the head of the humerus becomes stuck down to the glenoid ligament in addition.

Under full anæsthesia the joint is freed by

manipulation. Manipulation consists of putting the joint once through its full range in each direction and having obtained full range leaving it alone. It does not consist of moving the humerus like a pump handle nor does it require great strength. The danger of fracturing the humerus is not very great if the humerus is taken hold of close up near the head, and then only in old people or if the joint has been stiff for a long time.

Manipulation alone is useless. It is only the start of treatment and requires following up with heat, massage, and active exercise as already described.

It is advisable with certain patients to provide them with a light abduction splint to hold the arm abducted to 90° to obviate the danger of adhesions forming again, but as a routine this is not necessary. It is at the best an uncomfortable instrument and requires continuous adjustment. The ready co-operation of the patient is essential to the success of manipulation. They have to go through a considerable amount of pain before they receive their reward, and it is always advisable to prepare them beforehand with this knowledge, holding out to them a confident prediction of success in the final instance.

Lest the surgeon who manipulates one of these joints should be disappointed a few days afterwards when on examination he discovers that the joint has got stiff again, it is as well to remember that the humerus often appears to get stuck to the glenoid but at the new angle. This need occasion no anxiety, such stiffness always entirely clears up if full range has been attained at the time of manipulation. The movement, which it is most difficult to obtain full range of, is internal rotation. It requires a lot of hard work on the part of everyone, and in older patients is probably always slightly deficient.

It is commonly taught that after a simple synovitis of the shoulder full range can be obtained in three to

four weeks. This is not the experience of the author. It often takes as long as three months before the patient can use in a normal manner the affected joint, and is free from any kind of discomfort. When manipulation is necessary to free the joint, treatment requires continuing even longer, especially in a sensitive patient.

FRACTURES

The clavicle —The most common fracture involving the shoulder girdle is that of the clavicle in its middle third. In common with all other fractures its successful treatment depends upon a satisfactory reduction of the displacement. If only slight there is no difficulty, but otherwise if grossly displaced an anæsthetic is necessary. The routine method of fixation should be that of the three-handkerchief method. It is simple, easy to apply, the patient is comfortable and can move the hand in the sling at once. At the end of a few days with the patient recumbent the shoulder can be moved and after a fortnight only a sling is required to take the weight of the arm. With strapping, movement is restricted, the patient is uncomfortable and therefore Sayre's method should be abandoned.

Except for cosmetic effects it is unnecessary to confine the patient to bed. Even in a woman this is only desirable after gross displacement to prevent the formation of a large amount of callus. After all fractures of the clavicle there is a little bony swelling at the site, but in a very short time this gets moulded down and is not apparent.

Fracture of the inner end of the clavicle is rare and requires no special treatment, whilst that of the outer end occurs only a little less rarely. Displacement, if any, is slight, and the only treatment called for is the provision of a sling until symptoms have subsided, with such physical treatment as is wanted to relieve pain and swelling.

Surgical neck of the humerus —After a fracture of

the middle third of the clavicle this is the really only common fracture. It may be simple or comminuted, in the latter instance being associated very often with a fracture of the great tuberosity. Fortunately in the majority of accidents it is impacted, and if not already so in a very few days the fractured surfaces become stuck together so firmly that for practical purposes it becomes as good as impacted.

Always associated with a considerable amount of swelling, hæmorrhage and muscle spasm, the necessary elements which go to the production of a stiff shoulder are present. After a skiagram of the injured part has been taken and a decision has been made as to whether any displacement requires correction, the immediate treatment should be directed to relieving the symptoms, chiefly the muscle spasm which is painful. Quite often it is not realized what relief the patient gets when this is done. Heat in some form with gentle stroking massage is certain to increase very rapidly the comfort of the patient and often will enable him to sleep in comparative comfort even on the first night.

With regard to splintage or fixation, as has already been pointed out, an abduction splint is not free from disadvantages, and in the treatment of this fracture is not always desirable. An ordinary sling taking the weight of the arm in most instances is all that is called for. The patient does not need to be confined to bed, and at night prefers to lie propped up in bed with pillows rather than to lie in the prone position.

In those injuries in which the fracture is impacted movement carried out in the recumbent position may start almost at once, whilst in an unimpacted one it should not be delayed more than a few days. By this time the fracture has got sufficiently firm to be safe to move. Treatment now is followed out in exactly the same manner as described for injuries of the shoulder not associated with a fracture.

A very guarded prognosis should be given as to the length of time before full function returns. It often takes two or three months, or even longer.

Fracture of the great tuberosity — This is not a very common injury, and more often than not is associated with some other lesion. Unless grossly displaced a sling with early movement is all that is necessary. If not very much out of position at the time of the accident it is unlikely later to become so. When there is much displacement the tuberosity, if not replaced, may remain painful and hinder subsequent abduction by impinging against the under surface of the acromion.

Manipulation under an anæsthetic with fixation upon an abduction splint may be all that is necessary to reduce and keep it in position. Otherwise the most satisfactory form of treatment is to expose the fracture, and unless it is comminuted, to fix it in place with a beef bone peg. Should it be badly comminuted the wisest thing is to remove the fragments, and if it is decided to perform an open operation there is no advantage in delaying this. It is much easier to do this at once before it has become friable and apt to split up into pieces when the peg is driven through it. Early operation has the added advantage of allowing the exit of extravasated blood before it has had time to start forming adhesions.

Fracture dislocation of the shoulder — This is a serious but fortunately a rare accident, the head of the humerus being dislocated into the sub-coracoid position and the humerus fractured with gross displacement of the shaft inwards. A necessary complication of this injury is that there is considerable damage to the joint capsule, tearing of muscle tissue, whilst vessels and nerves are more liable to suffer injury than in other fractures.

Treatment in the first instance consists in attempting reduction of the displacement by manipulation under an anæsthetic. Should this fail the condition must

be tackled by open operation. The joint is exposed through an anterior incision, and the upper end of the shaft which is entangled in muscle tissue is cleared freely, and the head of the humerus identified. As much blood clot as possible is cleared out and then an attempt is made to impact the shaft of the humerus into the head, thereby providing a lever which may be used to reduce the dislocation. It may fail, in which case the head, which is always difficult to control, will have to be reduced alone and the fractured surfaces subsequently placed in contact. The head of the humerus should never be excised unless it is comminuted or repeated attempts at reduction fail, the subsequent functional result being better if it can be retained.

Fixation upon an abduction splint is desirable at the time of operation, and when the stitches are removed regular physical treatment is necessary to aid in restoration of function. Movement after this accident is always very considerably limited.

The other fractures of the scapula, those of the body, the neck, or the glenoid are rare. The two former only require the scapula strapping to the chest to prevent painful movement. Fracture of the glenoid by virtue of direct involvement of the shoulder joint is probably better treated at the start on an abduction splint, the period during which a patient requires to wear such a splint being controlled by the symptoms.

DISLOCATIONS

Dislocations of the shoulder.—This is the most common example of any dislocation. Usually it occurs without any other injury complicating the issue. In a straightforward anterior dislocation there should be little difficulty in its reduction. It generally almost reduces itself. Simple external rotation of the arm, raising forwards at the same time the point of the elbow, if carried out gradually paves the

way to an easy reduction. Great force is unnecessary and also not desirable. After reduction a sling to take the weight of the arm, with heat and gentle massage to relieve any muscle spasm is desirable. As soon as possible active movements should commence. It is not necessary to keep the arm to the side. It is very doubtful if the capsule is torn in the ordinary simple dislocation, and certainly the head of the humerus is not kept in its place by the capsule, the muscles of the shoulder carrying out this function.

In young adults a dislocation of the shoulder gives rise to little trouble, but in older subjects it is a troublesome accident. They take a long time to get over the effects, and nearly always have some permanent limitation of movement.

The undiscovered dislocation is fortunately rare and most often is seen in old people, quite often through their not having taken the trouble to seek advice. Considerable care is desirable in these old dislocations lest the humerus be fractured. Before attempting reduction of such a joint the arm requires pulling away from the side to stretch the soft tissues and then reduction may be tried. Up to about three weeks success should follow this routine, but later it becomes increasingly difficult. In really old subjects it is probably better to leave a late dislocation unreduced and restore their function as much as possible without doing anything further.

Recurrent dislocation of the shoulder occurs in healthy adults with good muscular development. The slightest accident or even abduction of the arm being sufficient cause for the joint to go out. Likewise the reduction is almost as easy. Weakness of muscle power is not the cause of this recurrence and retentive apparatus is of little, if any, value in its treatment, and to produce a permanent cure the condition must be tackled by operation.

Dislocations of the clavicle.—The two dislocations

of the clavicle are those which occur at the sternal end or at the acromio-clavicular joint. The former, comparatively rare, is nearly always forward. Seldom complete it is easily reduced and just as easily comes out again. Retention by strapping does little good and the condition usually remains permanent. The dislocation at the acromio-clavicular joint is quite common, being seen principally in the hunting field or on the football field. The clavicle is dislocated upwards and forms a prominence with tenderness and some swelling. It may be displaced only a little or almost completely. A good sling in minor displacements is all that is necessary, otherwise some form of apparatus approximating the point of the elbow to the acromio-clavicular joint must be worn until the condition is consolidated. There is always some permanent prominence left, but operation seldom needs consideration as the disability is negligible.

To reiterate, the whole course of our treatment of injuries of the shoulder should be coloured by our desire to prevent stiffness and to obtain full range of movement in every direction. In some patients, no matter how diligent we are, a certain limitation results and then manipulation is called for. There is a time to do this, and if done prematurely diminution of range rather than increased function will result.

of a woman, she should be treated by recumbency in bed for seventeen to twenty-one days with a small flat pillow between the shoulders and no pillow under the head. Reduction is rendered easier by the use of local anæsthesia and, as the clavicle is subcutaneous throughout its length, the injection is very simple.

Fracture of the surgical neck of the humerus—This is a common fracture, and results directly from a fall or blow on the shoulder or, indirectly, from a fall on the outstretched hand or elbow. It may be impacted without gross deformity, when the impaction should be preserved. If gross deformity is present the impaction should be broken down. The upper fragment is abducted and externally rotated, the lower fragment is adducted, internally rotated and displaced inwards and upwards. To reduce, the lower fragment must be externally rotated and traction made upon it in the same direction as that in which the abducted upper fragment lies. The ends will then usually snap into position. The tendon of the biceps frequently lies between the fragments, but is freed by external rotation and a correctly aligned traction. After reduction there is little tendency to displacement if the arm is fixed in abduction and external rotation. The possibility of two serious complications should be remembered in examining every case of fracture of the surgical neck: (1) dislocation of the head of the humerus from the glenoid; (2) fracture and separation of the great tuberosity of the humerus. If the head is dislocated an attempt should be made to reduce it at once by manipulation under general anæsthesia, aided by long axis traction of the limb in the abducted position. If this fails the joint must be opened and the head levered into the glenoid. If, for any reason, the patient refuses this treatment the position should be carefully explained in the presence of a reliable witness.

If the great tuberosity of the humerus is displaced so as to lie directly under the acromion, and unites in

this position, abduction of the arm will be greatly impeded or altogether lost. It is then necessary to expose the site of fracture and to fix the tuberosity to the neck, either by catgut sutures or by beef bone pegs. In lesser degrees of displacement, union in good position will follow if the arm is sufficiently abducted.

Supra-condylar fractures — This is a common fracture in childhood and its improper treatment may lead not only to a curtailment of movement at the elbow joint, but to that most dreaded of all complications, Volkmann's ischæmic paralysis. The fracture occurs from a fall on to the outstretched hand with the elbow in full extension. The fall is often a trivial one and may mislead the parent who delays seeking advice until the swelling makes a diagnosis uncertain without X-ray examination. The usual line of fracture is oblique from above downwards and forwards, and the lower fragment is displaced upwards and outwards behind the upper fragment. The prominent lower end of the upper fragment may press upon the brachial artery, the median and radial nerves. A complete reduction is essential if the risks of complications are to be avoided. Though it must be confessed that growth in childhood will round off many angulations, and that some ill-set fractures result in perfect function, yet the onset of ischæmic paralysis is so sudden and dramatic, the result is so sure, and the causation so certainly associated with incomplete reduction, that it is essential to strive for the completest reduction and the maintenance of the reposition during healing. A general anæsthetic is advised for reduction so as to eliminate the element of fear in childhood. Long axis traction is made upon the extended forearm, with counter-traction by an assistant upon the arm. After the fragments have been drawn apart simultaneous movement of hyper-extension of the lower fragment through the elbow joint and a backward pressure of the lower end of the upper fragment effect reduction, which is

only retained by flexing the forearm through about 40° upon the arm, on account of the obliquity of the line of fracture. When, formerly, a right-angled position was employed in treating these fractures, retention of the reduction failed and the movement of flexion was reduced owing to the upper fragment slipping forward, and was often never regained. By the use of the acutely flexed positions the movement of full flexion is the usual result. The forearm should never be fixed in such an acute angle of flexion as to interfere with arterial or venous circulation, as this will lead to ischæmic paralysis. But the surest way to avoid this calamity is by complete reduction of the fragments and retention of that reduction by flexing the forearm through 40° or the nearest angle to this that the circulation will allow.

Fracture of the external condyle.—This is a common injury in childhood and equals in frequency supra-condylar fractures. It is caused by falls on to the outstretched hand and may be accompanied by a fracture of the radius. Force transmitted from the hand passes through the wrist to the radius and to the capitellum. The ulna, not entering into the wrist joint, does not transmit any force, hence the infrequency of fractures of the internal condyle. The line of fracture runs from the outer edge of the trochlea to the external supra-condylar ridge and the fragment carries the capitellum. In adults the displacement is lateral and the fragment can easily be manipulated into position and retained by flexion of the elbow. In children, however, the fragment commonly rotates right round so that the fractured surface looks outwards and the whole fragment is displaced downwards. The fragment may rotate on a transverse axis also. Manipulation to reduce should be tried, but only too frequently it fails. An open operation is then imperative, when the fragment can usually be fixed by catgut sutures and the retention consolidated by 40° forearm

flexion If the fragment is left unreduced, much limitation of flexion and extension occur, and removal is indicated, as suture of the fragment to the shaft in old standing cases is impossible. Following removal or malunion in children cubitus valgus is liable to develop, involving the risk of late ulnar nerve paralysis This is caused by continuous stretching of the ulnar nerve in its groove behind the humerus the symptoms may be delayed many years after the development of the cubitus valgus Fortunately transplantation of the nerve to the front of the joint is almost invariably successful.

Fracture of the olecranon is a common injury caused by direct trauma or by violent muscular action Separation depends upon the laceration of the soft tissues If it is slight, and reduction can be easily effected, the fragment can be anchored to the ulna by pad and strapping. But if the bony surfaces cannot be felt to grate upon each other when reduction is attempted, a thick sheet of aponeurosis is lying between the fragments, and any union which may occur under these circumstances will certainly suffer subsequent stretching and loss of extensor function In these cases the joint should be opened, all blood clot removed and the aponeurosis dealt with by removal or replacement Occasionally the fractured ends can be held together by suture of the soft parts, but it is usually necessary to drill the fragments and fix by piano wire If the skin is damaged at the time of injury a delay of a week or ten days does not add to the difficulty of the operation There is usually only slight tension on the wire so that the elbow can be fixed in 90° flexion after the operation Results are good

Fractures of the shafts of the radius and ulna, with overlap—These are common and troublesome cases Besides the longitudinal displacement of both bones, the ulna usually angulates backwards and the radius

forwards, whilst the distal fragment of the radius is drawn towards the ulna by the pronator quadratus and is pronated. The proximal fragment of the radius is usually supinated by the biceps, even when the fracture is below the insertion of the pronator quadratus, because the supinating force of the biceps is greater than the pronating force of the pronator quadratus. These displacements of the ends of the radius, supination of the upper and pronation of the lower determine the position of full supination of the lower fragment if the fractured surfaces of the radius are to lie in apposition.

An attempt should be made to reduce the overlap by strong longitudinal traction, an assistant making counter traction upon the arm. The hand should be held in full supination and digital manipulation used to bring the ends in apposition. General or local anaesthesia must be used. The result should be checked by X-ray films in two planes. Reduction by traction and manipulation is notoriously difficult. If the overlap is left unreduced union will occur, but the resulting range of supination and pronation will be reduced, and the loss compensated by rotation at the shoulder joint.

If the overlap cannot be reduced, two methods may be employed. (1) *Continuous longitudinal traction* by means of a Thomas' arm splint, with the hand in supination. The result should be frequently checked by X-ray films and if, as not infrequently occurs, the overlap persists, recourse should be made to (2) *reduction by the open method*, both ends of the radius and ulna are exposed and, by leverage, brought into apposition. If the fractured ends are transverse the jaggedness of the surfaces will usually hold them in opposition, or they may be forcibly impacted. If the line of fracture is oblique a central bone peg or an absorbable suture should be employed. The use of metal plates is not recommended on account of the frequency

of non-union after their employment in this situation. Whatever splints are used two points should be carefully observed. (1) to see that the subcutaneous border of the ulna is kept straight and not allowed to angulate by sagging into the splint; (2) that neither splint nor bandage press upon the radius so as to diminish its natural outward convexity. Active movements of the fingers should be commenced at once, but of elbow, wrist and forearm only after about four weeks.

Lower end of the radius —The commonest and most important fracture of the lower end of the radius is the Colles, in which the lower fragment, carrying with it the whole hand, is displaced dorsally and to the radial side. Separation of the lower epiphysis may occur up to the age of twenty-one, and the signs and treatment are similar to those of a Colles. The line of fracture is through the lower one inch of the radius, is transverse from side to side and oblique forwards and downwards from the dorsal to the volar surface. The articular surface of the radius is directed downwards, backwards and outwards. The fragments are commonly impacted. The styloid process of the ulna is detached or the internal lateral ligament of the wrist is torn.

The so-called "dinner fork" deformity renders the diagnosis easy. If this deformity is not present after a severe sprain of the wrist it is advisable in all cases to examine by X-rays, as a fracture with impaction without marked displacement or an oblique linear fracture into the joint as from a back-fire may be present and influence both the method and duration of treatment, and the prognosis.

As to the question of disimpaction, no hard and fast rule can be laid down. If the deformity is slight, the patient old and occupation light, the impaction may remain and treatment should be directed to keeping the fingers and wrists supple. All other cases should be disimpacted and treated by manipu-

lation, fixation and active exercises. A good rule is, if in doubt disimpact, because union in the corrected position is sure and rapid, and the return of function occurs in favourable conditions. Non-union is practically unknown. compare this with impaction of the neck of the femur in subcapital fractures; these should never be disimpacted in the aged for fear of non-union. The fragments must be disimpacted, in recent cases this can be done by tractions, flexions and manual pressure. In cases of long standing, a Thomas' wrench or wedge may be required, whilst later, an osteotome may be employed to separate the fragments along the line of impaction.

In recent cases the injection of 20 c cm of a two per cent solution of novocain is a most satisfactory analgesic, a single injection into the traumatic sac from the dorsum will usually suffice, a second on the palmar aspect may be required. After reduction, the wrist should be volarflexed from 45° to 60° and fixed in this position by a single dorsal plaster slab* applied directly over stockinette.

This flexed position should be maintained for six to eight days, when the fractured ends will have become "sticky" and a return to the mid-position of the wrist joint will not cause displacement. The flexed position of the wrist is indicated on account of the obliquity of the line of fracture, the dorsal tendons, being tense in flexion, prevent the lower fragment slipping upwards and backwards. The plaster casing aims at fixing the wrist in flexion rather than exerting any direct pressure upon the lower fragment. When the parts are analgesic, and after setting the fracture, it is well to make a second plaster splint by moulding a plaster folder to the palmar surface of the forearm.

* A plaster laster of Paris slab or folder is easily made from an ordinary the bandage five yards long and five inches wide. By folding with sevege in twelve inch lengths two folders are obtained each very light thicknesses of muslin, which are strong enough and

and hand in the neutral position it will be used when the dorsal plaster is removed at the end of a week. Each of these plasters must be short enough to allow full flexion and extension of the thumb and fingers at all their joints. If these movements are commenced within twenty-four hours of the setting there is no danger of subsequent finger stiffness and massage can be dispensed with entirely. This treatment gives far better results and in a shorter time than when a movable splint is employed and the masseuse allowed to remove and replace the splint.

In conclusion, I cannot stress too strongly the importance of X-ray proof of reduction and retention in every fracture, of the dangerous futility of an X-ray in one plane only and of the disastrous financial situation which may arise from neglect of this sound surgical principle.

Injuries of the Wrist

By R. WATSON JONES, B.Sc., M.Ch. Orth., F.R.C.S.

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FRACTURES OF THE LOWER END OF THE RADIUS

FIVE thousand years ago an Ancient Egyptian fractured the lower end of his radius. Gutter splints were made from strips of bark, padded with dried leaves and fibre, and only the untimely death of the patient from an unrelated cause has enabled Sir Arthur Keith to demonstrate in the Royal College of Surgeons Museum to-day, the method of immobilization in use fifty centuries ago. It stands as a reproach to modern civilization, that despite an apprenticeship of such amazing duration, Colles' fractures are still allowed to unite with deformity and with stiffness of the fingers. Yet it is easy to secure such cosmetic and functional perfection that it is impossible to determine clinically which wrist has been fractured, in at least 80 to 90 per cent of cases. Three principles of treatment must be observed —

(1) Manipulative reduction, controlled by immediate X-ray through the splints, and repeated as necessary until a perfect position is secured. (2) Complete and undisturbed immobilization for four weeks. (3) The institution on the first day of "functional treatment" including full movements of the fingers, elbow and shoulder.

Manipulative reduction — The displacement of the distal fragment is in two directions: (a) a backward displacement, and tilt, (b) an outward, radial, displacement and tilt. Incomplete correction of the backward displacement impairs the functional result, because the altered axis of the wrist joint causes permanent

weakness of grip. Incomplete correction of the outward displacement impairs the cosmetic result, because the whole hand remains deviated to the radial side with resulting prominence of the lower end of the ulna. This ugly deformity is conspicuous if the uncorrected outward displacement is of no more than one or two millimetres

In the manipulative manoeuvre taught by Sir Robert Jones,¹ both displacements are simultaneously corrected by a pronation movement of the distal fragment which thrusts it forwards and inwards. Although perfectly effective in the hands of its author, in other hands this method frequently leaves the radial displacement incompletely corrected. Perfect reduction is secured with much more certainty, if the deformity is visualized in its two component parts, and each element separately corrected. In the case of a left Colles', the operator grips the distal fragment with his right hand, and with strong pressure over the back, it is pushed and tilted forwards. A new grip is now taken, and by equally strong pressure applied over the outer side of the distal fragment with the operator's left hand, it is pushed and tilted inwards. Spreading of the fragments in a comminuted fracture is corrected by compression between the operator's two hands, in both the antero-posterior and the lateral axes. Compression manipulation of this type, as opposed to leverage manipulation, is highly successful in replacing detached marginal fragments and restoring a smooth articular surface (Fig. 1A). The fact that a fracture of the lower end of the radius is comminuted is frequently claimed as an excuse for failure to reduce the displacement, and manipulation is said to be contra-indicated. Such teaching is retrograde and indefensible. If the fracture extends into the articular surface, the merest trace of uncorrected displacement will cause painful movement, grating and osteo-arthritis. On the other hand, if the

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used the dorsal splint must extend to the knuckles in order to prevent dorsiflexion movements of the hand, but the palmar splint must stop short of the thenar eminence. The use of a splint extending into the palm of the hand is not only unnecessary, but is dangerous. Atrophy of the thenar muscles, and stiffness of the fingers are inevitable, and frequently there will be recurrence of the backward tilt of the distal fragment. For these reasons, Carr's splint is a relic of the past, and in this enlightened age should never be used. A well-applied closely fitting (skin tight) plaster is an ideal means of immobilization, because a sling is unnecessary; the limb is put through the sleeve in the ordinary way, and the plaster being cut away from the palm of the hand, the arm may be used for eating, dressing, light housework, or carrying a stick or bag. Not only is the inconvenience of a fractured limb avoided, but such functional use prevents stiffness of joints, wasting of muscles and decalcification of bones. The plaster should be applied with the wrist in the neutral position and not in the fully flexed position of the Cotton-Loder method. In this position the fingers cannot be closed, and the recovery of wrist movement is delayed.

Functional treatment.—In the presence of infection or trauma, lymph is poured out into the subcutaneous spaces, and will organize and form adhesions. If under these conditions the metacarpo-phalangeal joints are immobilized in extension for so short a time as four weeks, the patient will never again flex his fingers fully, and a far more serious and intractable disability will arise than that caused by malunion of the fracture. The surgeon's responsibility lies not simply in leaving the joints unsplinted, but in stimulating the patient to move them fully in all directions, despite the swelling, œdema or discomfort which may be present during the first day or two. Movement, combined with elevation of the limb (if necessary on a frame)

will enable the swelling to subside very rapidly.

It is equally important that abduction of the arm to the side of the head, and rotation in each direction should be practised frequently from the first day, in order to avoid the very disabling stiffness of the shoulder which ten or fourteen days in a sling will produce, if the wrist fracture has been associated with slight and otherwise symptomless traumatic synovitis of the shoulder.

If in the treatment of a fractured wrist the surgeon sends a patient for massage and electrical treatment, he admits failure. The indications for physiotherapy are stiff joints, atrophied muscles, decalcified bones, and recurring oedema from impaired circulation. None of these complications should have been allowed to appear, and the only part that the masseuse can justifiably play in modern traumatic surgery is to direct and supervise the patient's own exercise, rigorously goading him into activity instead of lulling him to sleep with soothing massage

MALUNITED COLLES' FRACTURE

Untreated Colles' fractures can still be reduced by manual manipulation until two or three weeks after the date of injury, and for a further few weeks there is still a possibility of securing full correction by using the 'Thomas' wrench.² In old cases, however, it is difficult to secure a perfect cosmetic result because the radial deviation can only be corrected with considerable difficulty, and it is then better to perform an osteotomy of the radius at the level of fracture, subsequently treating the case exactly as in recent injuries. By means of an osteotomy through a one-inch incision, deformities of ten or twenty years' duration can be corrected with complete success.

DISPLACED LOWER RADIAL EPIPHYSIS

During the first two decades of life, Colles' fracture

is rarely sustained, and the usual injury is a backward and outward displacement of the lower radial epiphysis with a flake of bone from the diaphysis. The type of displacement, clinical diagnosis and treatment differs in no respect from the corresponding injury of the adult

In severe displacements the carpo-ulnar ligaments are torn and the epiphysis with the carpus and hand is widely displaced, leaving the ulna and the radial diaphysis in normal relationship. There is a second anatomical type which the author has described as "displacement of the radial diaphysis,"³ in which the carpo-ulnar ligaments remain intact, and it is the inferior radio-ulnar group of ligaments which is torn. The ulna, radial epiphysis, carpus and hand now retain an undisturbed relationship and are all displaced backwards and outwards in relation to the radial diaphysis. If the injury is visualized as a forward and inward displacement of the radial diaphysis, the frequent complication of ulnar palsy by direct contusion is explained.

FRACTURE OF THE CARPAL SCAPHOID

Following a fall on the outstretched hand, or a backfire injury of the wrist, tenderness over the radial side of the joint immediately below the tip of the radial styloid must be regarded as evidence of a fracture of the scaphoid until it has been excluded by X-ray examination. Delay in establishing the diagnosis may mean all the difference between a wrist indistinguishable from normal and a weak painful arthritic joint incapacitating the patient from heavy work and from even the less energetic recreations of golf, tennis and badminton.

Until recently it was the exception to see a fracture of the scaphoid united by bone, and only a few years ago Thurstan Holland declared that he had never seen bony union after this injury. For many years

Sir Robert Jones has advocated prolonged fixation in dorsiflexion, and it has now been shown by Bohler that if this complete and prolonged fixation is combined with functional treatment sufficient to maintain free circulation and prevent atrophic changes, bony union can be secured in a large proportion of cases.⁴

As soon as the diagnosis is established the joint must be immobilized in 30° of dorsiflexion, but not by means of a cock-up splint, because if the palmar part of the splint is large enough to prevent lateral movements, it will interfere with the grip, prevent the patient from using the limb, and inevitably give rise to decalcification of the carpus which may inhibit union. A dorsal plaster cast is made by moulding a plaster slab directly on to the limb with no padding between. When completed it should extend from the upper forearm to the knuckles, and laterally it must reach the midline of the forearm and hand in order to prevent side-to-side movements of the wrist. Since the scaphoid is almost entirely intra-articular, union depends on the development between the two fragments of fine capillary vessels with osteoblasts, and there is no periosteal bone formation to assist in consolidation. The slightest shearing movement of the two fragments will rupture all the vessels, and if only repeated once in ten days will inhibit union. The cast must therefore fit very accurately and no movement is allowed until in about three months' time there is X-ray evidence of union.

Throughout this time, with the cast kept firmly in position with strapping and bandage, the limb must be used for all ordinary purposes. We have had patients who have continued their ordinary employment as housewives, motor drivers, schoolmasters and even ship riveters. If the patient is willing to co-operate in this way, a wrist joint may be immobilized for 12 months, and the X-ray after that interval taken immediately the cast is removed will show no trace

of atrophic bone change.

UNUNITED FRACTURE OF THE SCAPHOID

The old operation of excising half or the whole of the scaphoid for non-union is practically obsolete. The operation has very little effect on the range of movement, it does not cure the pain, and it aggravates rather than relieves the tendency to osteo-arthritis.

On the other hand, the same treatment which is so successful in recent fractures, has a very beneficial influence in old fractures and in about 75 per cent of cases bony union can be secured even two or three years after the fracture, if immobilization is continued for a sufficiently long period. Whereas in recent fractures union can be secured in two to three months, in old fractures with cavity formation the average time is six to twelve months. Serial X-rays taken at two-monthly intervals show gradual obliteration of the cavity, the wall of sclerosed bone adjoining the cavity absorbs, the density of the avascular half of the bone gradually approximates that of the remaining carpal bones and finally firm bony union is seen (Fig 2). In old ununited fractures union can be considerably accelerated by multiple drilling of the fragments, either subcutaneously or through a half-inch incision over the tubercle of the scaphoid; this breaks up the wall of sclerosed bone and allows the more rapid development of blood vessels between the two fragments. After this simple operation, even in old cases, union may be secured in three or four months instead of six or twelve months.

DISLOCATION OF THE CARPAL SEMILUNAR BONE.

The semilunar is always dislocated forwards into the very confined space beneath the anterior annular ligament which is already fully occupied by the flexor tendons of the fingers and the median nerve. The typical clinical signs are, therefore: (a) immobility of the semiflexed fingers; (b) median palsy in 50 per

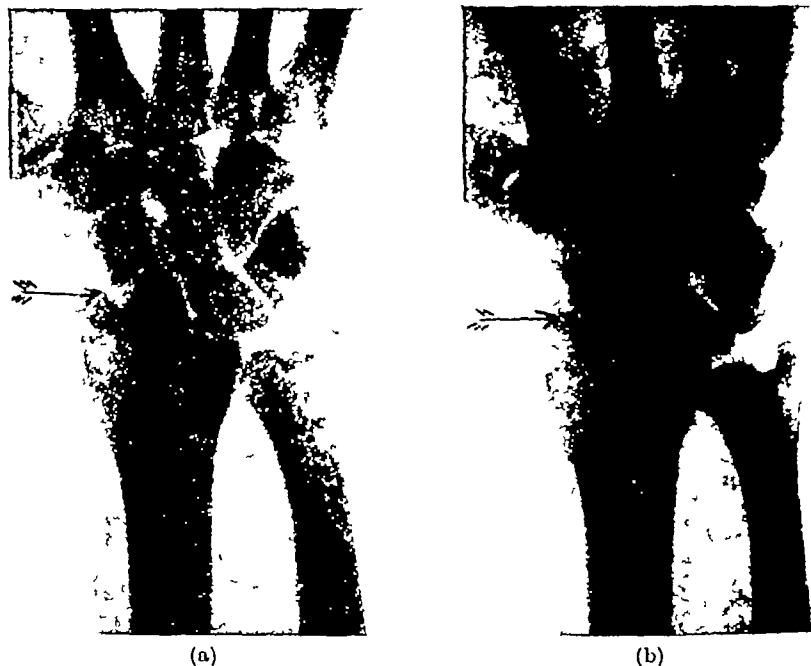


FIG 2—Ununited fracture of carpal scaphoid of nine months' duration (a) before treatment, (b) after six months' treatment in a dorsal plaster cast. The wrist is now indistinguishable from normal. The patient still plays golf with a handicap of four.

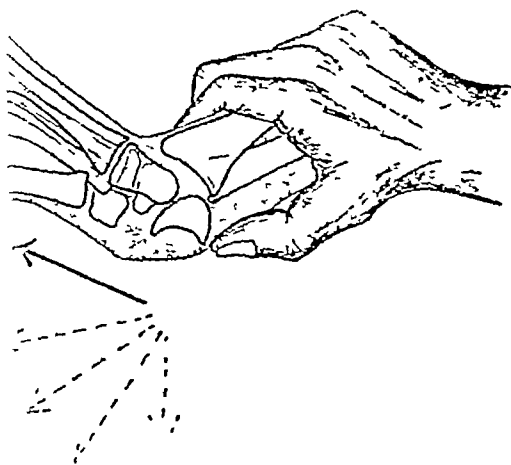
cent. of cases, (c) swelling and painful limitation of wrist movement with no obvious deformity.

Until recent years the large majority of dislocated semilunar bones were excised. Although the results of this operation are better than would be expected, a normal range of movement and normal strength of grip is never restored. It is moreover quite easy to reduce the dislocation manually during the first fortnight and by open operation during the first few months.

In the method of manipulative reduction described by the writer,⁵ the operator presses on the front of the semilunar with one thumb and applies traction to the remainder of the carpus with the other hand. Whilst maintaining strong traction the wrist is gradually flexed to the right-angled position (Fig 3). In difficult cases an assistant should press over the front of the

both thumbs and the operator concentrate and flexion of the wrist. Reduction must be followed by immediate X-ray examination, and the wrist then immobilized in 30° of palmar flexion for not less than seven days, by means of a dorsal cast.

A second cast with the wrist in slight extension should be retained for a further ten days, after which fixation is necessary. The wrist should be movable from normal within four to six weeks.



This method of manipulative reduction of dislocation of the wrist, avoiding the use of a wrench or wedge, the risk of injuring the median nerve is avoided.

Chronic injury

- If several weeks' duration where manipulation has failed, the author has practised a method of reduction with successful results. Through a dorsal incision the head of the os magnum is dissected and all adhesions of the carpus are freed. The same manipulation is now performed and the semilunar previously hidden from view is pushed up into position.

REDUCTION OF THE SEMILUNAR WITH HALF OF THE SCAPHOID

Dislocation of the waist of the scaphoid is not infrequently combined with dislocation of the semilunar



FIG 4A —Fracture of scaphoid with dislocation of semilunar and half scaphoid. Also comminuted fracture radial styloid process (Note outward subluxation of the whole wrist, the distal half of the scaphoid impinging against the radial styloid)



FIG 4B —Same case as Fig 4A, after manipulative reduction of the dislocation (through plaster) The comminuted fracture of the radial styloid has been reduced by lateral compression of the wrist between the operator's two hands A perfectly smooth articular surface has been restored

ich carries forwards with it the proximal half of scaphoid (Fig 4A). Excision of the semilunar and

half scaphoid causes a very severe disability because the remaining carpal bones are almost always subluxated to the radial side. The remaining half of the scaphoid impinges against the tip of the radial styloid process, movements are seriously limited, osteo-arthritic changes rapidly supervene and a bad cosmetic result is given by the radial deviation of the hand and the prominent lower end of the ulna.

The correct treatment is to reduce the displaced bones by manipulation (Fig 4B) or by operation according to the duration of the injury, and then treat as for a fracture of the scaphoid, by prolonged immobilization in dorsiflexion combined with functional treatment. Perfect results can be secured.

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Injuries of the Hand

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TO all men whose livelihood depends upon the inherited or highly practised skill of their fingers—and they are many and of great variety, ranging from cotton spinners and surgeons to pickpockets and card-sharpers—a stiff forefinger or a tender scar in the pulp may be a much more serious matter than an acute appendix, and incidentally may need a greater degree of surgical skill for its satisfactory treatment. Before detailing specific injuries of this region, and the technique of the proper methods of dealing with them, there are certain fundamental principles to be appreciated.

The first point in setting about the treatment of an injured hand is to find out exactly what the patient has to do with it when it has recovered. As a general rule, in unskilled manual workers, the breadth of the hand must be preserved, and as much as is at all possible of the gripping power and of the spreading area of the fingers. In such cases, it is important to save any part of the finger, if a mobile, well-covered, and non-tender stump can be provided: but even in these cases, a stiff or tender stump is far worse than useless. In men who work among machinery, it is best to amputate a badly injured finger at once, as in these forms of work, even a partly stiff finger—which cannot be fully controlled, and cannot instinctively

re of itself—becomes a very real danger to its

In most of the highly skilled manual
readth of the hand, and the number of
ss important than the dexterity and
e remaining digits, and in these people,

the best results are obtained by amputating injured fingers, with the heads—and in many cases most of the shafts—of the corresponding metacarpal bones. In these cases, the metacarpal bone of each finger is simply a unit in a complicated lever, and when the useful part of the lever has been lost, there is no point in keeping the base, while its removal gives a much freer play to the remaining digits.

The fingers have very highly organized nervous systems, and septic inflammation in them sets up without any delay a neuritis, which is both progressive and intractable, so that it follows that the right time to amputate a finger which is so damaged that it will not recover sufficient function to help its owner in his work, is immediately after the accident. The very usual, and extremely human, tendency, to try and save such a finger, very often leads to an inflammatory infiltration of the hand and other fingers, and commonly ends in an unsatisfactory amputation, after the patient has endured months of painful treatment. The stump in these cases can seldom be well covered, and the neuritis persists indefinitely, causing weakness and great discomfort, and sometimes very disabling tenderness and hyperæsthesia. Besides all this, the pain from the inflamed nerves is extremely apt to interfere with the normal reflex control and co-ordination of the other fingers, leading to disabilities which are often classed as hysterical, but which in reality have a very real physical basis. Finally, most of the tragic results in these injuries—from tender scars to rapid death—are due to sepsis, and in particular to sepsis pent up in the depths of wounds which have been unwisely closed.

The immediate toilet of wounds in the hands and fingers consists in opening them up, washing them, and cutting away crushed and devitalized skin and other tissue. In all save the slightest cases, this should be done under a general anæsthetic. If there is the slightest risk of infection in the depths of the wound,

it is wiser and safer to leave it open, and dress with eusol or acriflavine. Clean incised wounds may safely be sutured after the use of acriflavine. Others may be very lightly drawn together. At this time also, very careful examination should be made for divided tendons, which should be reunited at once. In the hand and fingers, reunion of divided nerves is seldom possible or satisfactory. Fractured metacarpal bones and broken phalanges should be moulded into position under general anæsthesia, and set with a pad of wool in the palm, and the fingers well flexed over it. I put most of these cases into plaster of Paris for two weeks.

Where the presence of a division of tendons has been missed, or a primary suture has failed, an attempt should be made to reunite the ends at the very earliest feasible moment, which means as soon as active sepsis has subsided. These operations are often much easier than one would expect. The divided ends of the tendons are often, and indeed usually, not very far apart, and are not difficult to recognize. They are best sutured with fine silk, and afterwards the hand must be put in a position which relaxes the tension on the union to the greatest extent.

It goes without saying that where both flexor tendons to a finger have been divided, the very greatest care must be taken to unite the correct ends, and a glance at Cunningham's "Anatomy" is a help to this end. The extensor tendons are liable to several lesions peculiar to themselves. A sharp blow on the end of the finger may jar the tendon from its attachment to the end phalanx, causing the end phalanx to drop helplessly. The finger concerned should be splinted at once in the extended position for a month, and then mobility gradually restored by light active—never passive—movements. This nearly always gives a perfect result. If it does not, the tendon should be cut down upon, and stitched into place, the finger being again splinted for a month.

Over the back of the proximal interphalangeal joint, the extensor expansion is also apt to be torn, but in this position it splits longitudinally, the two sides slipping towards the palmar surface, and the finger is left helpless to a variable degree, as this injury is not often complete. The treatment here is to cut down and suture the tear at once.

Fingers that have become contracted into the palm following injuries may be straightened under anaesthesia, and put up in that position in plaster for a couple of months, with a fair chance of success, provided this is done before the bones and joints have altered anatomically. If the contracture returns, and seems to be due to a shortening of the flexor tendons, it is possible to lengthen these by a tendon-sliding operation, similar to that which is useful in the tendo Achillis. But to slide both the flexor tendons of a finger successfully is necessarily a very delicate operation.

All hand and finger wounds may become infected, but many of the most serious cases occur in wounds which are so minute as to be considered of no importance in the first instance. Pricks from pins and needles and from tiny wood or metal splinters in many forms of work are so common as to escape individual attention. The first sign that such a minute lesion is going to lead to trouble is aching and throbbing in the infected area, followed occasionally by rapid streptococcal cellulitis, but much more usually by the development of a localized inflammation in the affected digit. Most of these injuries occur under the nail, or in and around the pulp. The nail should be removed, and the inflamed area lanced, as soon as ever the trouble begins to manifest itself. If the sepsis spreads in the end of the finger, the bone of the end phalanx is very likely to become involved. If the end phalanx of a finger remains swollen and septic for two weeks, it may be taken for granted that the bone

is involved, and will necrose. The sequestrum usually involves the distal two-thirds of the phalanx, the basal third and with it the tendon attachments and the terminal interphalangeal joint remaining unaffected—and if the finger is freely incised, and the sequestrum removed as soon as possible, these structures usually escape altogether.

As soon as there is the faintest sign of involvement of the flexor sheaths, however (shown by tenderness on pressing over them), they should be opened. Septic infection in the fingers is not a desperately serious matter, so long as the tendons survive. They receive their blood supply from the vessels in the very delicate synovial ligaments called *vincula accessoria*. The effect of an acute septic inflammation in the closed tubes in which the tendons run, is to raise the tension immediately, and the vessels are literally choked by the pressure of the inflammatory products. Once this happens, death of the tendons concerned is certain. Therefore, the free opening of the tendon sheaths must be done early.

I saw a case some time ago in which a little finger had been injured, and had become extremely septic. The whole digit was swollen and very inflamed. This condition had been going on for over a week, but the tendons of the finger were still intact, and all the movements present. The explanation was that a small punctured wound had occurred in the palm at the same time, and opened the tendon sheath high up. From this small wound, pus was exuding in quantity, and it had undoubtedly acted as a safety valve, and saved the vitality of the tendons.

Site of incisions.—Incisions into the end phalanx of a digit should be made in the first place just to the side of the nail. If necessary, they may be made in this position on both sides, and they may even be joined across the tip of the finger, just in front of the nail. *They should never in any circumstances be made in the tissue of the pulp.* If they are, the tactile function of the pulp will be impaired, and a tender scar—which cut will be very intractable and disabling—is sure to be.

The incisions to open the flexor sheath of a finger should be made along the sides, well in front of the mid-line, and care must be taken not to divide the bands over the flexures of the joints, or prolapse of the tendons will occur. Inflammation is apt to spread from the flexor sheaths along the sheaths of the lumbrical muscles, and this should be watched for, and when it occurs, opened from the back of the web.

In the case of the thumb and little finger, sepsis has a free passage into the lower part of the forearm, in the other fingers, it is arrested where the sheaths end, about a finger's breadth in the palm. Inflammation in the palm should be incised along the lines of the metacarpal bones.

It is well to note that a suppuration in the palm causes a great deal of œdematous swelling in the soft tissues of the dorsum, but this should not be incised. When the suppuration has reached the lower part of the forearm, it should be relieved by incision on one or both sides, just above the wrist, and the point of a pair of dressing forceps passed inwards behind the tendons (Hilton's method). Here again, the incision should never be made in front of the wrist or down the middle of the forearm, or crippling adhesions and contracted scars will result.

Amputations —All plastic operations on the hand, and all amputations, require the use of a tourniquet. In amputating phalanges, it is very important to obtain the covering from the fleshy tissue on the front of the digits. In the case of the end phalanges, it must be remembered that the nail bed goes back at least to the level of the end joint, and the tissues on the dorsum should be removed to beyond that point, or small nail remnants will continue to appear. Both flexor and extensor tendons should be looked for, and stitched in position.

In amputating a finger, in skilled workers, the head at least of the metacarpal bone should be removed.

I divide this bone by a metacarpal saw. The tendons running to the finger should be isolated, pulled well down, and divided as high up as possible. The portion of the flexor tendon sheath which lies in the palm is full of nerves, and if it has been inflamed, it will remain permanently tender. Therefore, it should be carefully dissected out. Both digital nerves should be found, pulled down, and divided at least three-quarters of an inch above the level of the amputation. They are quite easy to find, lying on the sides of the finger, slightly towards the palm, and the guide to them is the small artery which runs with them, and which is easily found. It is important not to damage the interosseous or lumbrical muscles more than necessary. A minor advantage of the removal of part of the metacarpal bone, particularly in girls, is that it leads to a very much better looking hand than an amputation at the metacarpo-phalangeal joint.

In conclusion, I should like to stress the very great advantage of metacarpal amputations, the necessity for dissecting out the digital nerves and finger tendons, and the usefulness of general anæsthesia, and of a tourniquet, in dealing with these conditions; but very particularly would I caution against the incising of the pulp and not the sides of fingers.

Fractures of the Pelvis

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IN the study of fracture of the pelvis the views of the older writers will be found instructive and fascinating. During such literary excavations we come across some useless debris, but not infrequently the labour is rewarded by the discovery of nuggets of pure gold. Malgaigne and others conveyed the impression that extensive fractures of the pelvis were rare, and that recovery seldom followed. Both statements require revision. Fractures of the pelvis have increased in frequency with the development of industrial machinery and rapid transport. The crushing injuries associated with accidents to motor cars, aeroplanes, and the modern factory, supply us in bulk with this morbid material. Nor is the prognosis bad. Injuries contemplated with awe by our predecessors are treated with success by modern methods.

Although fractures of the pelvis usually follow severe violence, it is well to remember that some cases of extensive injury come with a history of only slight trauma. Long before the days of X-rays it was pointed out by such authorities as Dupuytren, Hamilton, Pott and Cooper, Erichson and Bennett, that no portion of the pelvis is immune from fracture.

In the wards of Mercer's Hospital, Dublin, and in private practice, I have seen fractures of the pelvic girdle, of the ilium, of the pubis, of the acetabulum, sacrum and coccyx, some of them many times. I have not seen a case of isolated fracture of the ischium, but Wakeley¹ mentions five in a series of 100 cases.

Fracture of the pelvic girdle—These fractures result either from severe crushing injuries, or a direct fall. In the hunting field, the rider is thrown from a horse

and the horse rolls on him, in the street, the victim is run over by the wheel of a motor car or bus. The anterior portion of the pelvic arch breaks, and posteriorly, there is either dislocation of the sacro-iliac joint or fracture of the ilium vertically downwards from the crest to the great sciatic notch. Alternatively, the sacrum may give way. The fracture in front is most often on one side, and the fracture behind on the opposite. In some cases both ilium and sacrum are involved posteriorly, the line of fracture passing through the ilium near the upper angle of the sacro-ilia joint, and then downwards on the medial side of the joint through the lateral part of the sacrum.

Again, the fractures in front and behind may be limited to one side only. This variety is comparatively uncommon. When the pelvis is broken in front and behind, the bone and the attached lower extremity are connected with the rest of the body only by the soft parts which unite the pelvis to the spinal column and trunk. These soft parts are often stretched or lacerated.

Injuries of such severity are easily diagnosed. I know of no cases in surgery which suffer from more extreme shock. The pelvis is often distorted and deformed. Displacements may be detected by palpating the pubic region and iliac crests or by a finger in the rectum. The patient is conscious of the loss of all pelvic support and is quite helpless. Any movement such as coughing, or heavy breathing, may cause the greatest distress. Shortening may be found by measuring from the umbilicus to the ankle. Widespread ecchymosis is the rule.

Sometimes there are serious complications. The urethra, bladder, rectum, vagina and the great vessels and nerves may be involved. Rupture of the urethra, in my experience occurs most frequently after partial and isolated fracture in the region of the symphysis pubis or from injury to the perineum without fracture.

Rapid death may follow the tearing of the large pelvic veins, or pulmonary embolism may occur at a later date. Gangrene of the leg may develop from injury of the external iliac artery and large extravasations of blood may be followed by suppuration. It is obvious that the lumbo-sacral cord may be involved in any fracture in the region of the sacro-iliac joint, or the sciatic nerve may be stretched or crushed, giving rise to prolonged and protracted neuralgia.

Rupture of the urethra and bladder must be dealt with immediately and directly. Retention or extravasation of urine brook no delay. Reduction and fixation of the fractured pelvis cannot be postponed in the presence of such urgent problems.

I have operated recently upon seven cases of ruptured urethra⁴. The injury does not, as a rule, occur in the membranous portion. It is far more common in the bulbous portion of the urethra, well in front of the triangular ligament, but the site of rupture is often near the neck of the bladder above the triangular ligament in cases of extensive pelvic fractures. It is noteworthy that if the membranous segment is severed, a tight stricture in the process of healing is the exception and not the rule. For many years it was taught erroneously that the common site of rupture was between the layers of the triangular ligament, and that when this occurred an unmanageable stricture was frequently the result. Rupture occurs, in my experience, in male patients between the ages of 30 and 40, but some French authorities state that it occurs more often in boys. When the rupture is in the bulbous portion, the common situation, there is almost invariably a perineal hæmatoma, and blood trickles from the meatus immediately after the injury. There is an intense but ineffectual desire to pass water. Local pain is severe. If the patient has emptied the bladder before the accident, and this information should always be asked, there

will be no extravasation of urine. Even if the bladder is full at the time of the accident, extravasation is prevented often for many hours by a reflex spasm of the compressor urethrae muscle. This beneficent and enduring spasm is nature's first aid to the injured. If the urethra is only partially torn, blood will continue to trickle from the meatus, but when the division is complete the retraction of the parts favours hæmostasis. After complete division the line of least resistance for the escape of blood is into the cellular tissues. It follows that the gravest rupture is accompanied by the largest perineal hæmatoma, partial ruptures are indicated by more constant bleeding through the meatus, and a smaller hæmatoma. Bailey² reminds us that a black patch on the glans penis is a sign of fatal omen. It probably indicates that the whole of the corpus spongiosum is infiltrated with urine.

The diagnosis of ruptured urethra presents no real difficulty, but in coming to a decision the possibility of a ruptured bladder above or below the reflection of the peritoneum must not be lost sight of.

When confronted with a case of ruptured urethra it is well to have some definite plan of action. Much of the literature on the subject is not helpful in this respect. I believe that operation should be undertaken in all cases whether an instrument can be passed or not. I believe also that the bladder should be opened by suprapubic cystotomy in every case, for two reasons. In the first place, there is no difficulty in passing a catheter in retrograde fashion from the bladder to the position of the rupture. The point of the catheter can then be exposed in the perineum, and is a certain guide to the proximal end of the divided urethra. Secondly, suprapubic drainage permits healing of the divided ends of the urethra without infection and resultant stricture.

The immediate treatment of ruptured urethra is of such primary importance that a short account of the

operation may not be out of place

Operation —When the patient is first seen he is given a hypodermic of morphia. If the bladder is felt distended, or the patient states he has not passed water for some hours, a suprapubic puncture with trocar and cannula is made before removal to hospital. After these two preliminary measures there is no need for hurry. In hospital the suprapubic and perineal regions are shaved and disinfected. The anterior urethra is washed out with 2 per cent. mercurochrome solution or other antiseptic by passing the nozzle of a suitable syringe into the meatus. No attempt should be made to pass a catheter unless the diagnosis is in doubt. If the patient is not in a state of extreme shock, and if the fractured pelvis permits rolling him on his side, a spinal anæsthetic should be given, together with an injection of ephedrine. When anæsthesia is secured, the buttocks are brought down over the end of the table. The legs are spread out and held in position by two assistants. (The lithotomy position is undesirable, as it puts the injured parts under tension.) The bladder is opened above the pubis, and with the finger as a guide, a catheter* or an instrument specially designed by the writer (Fig. 1), is passed in retrograde fashion. The

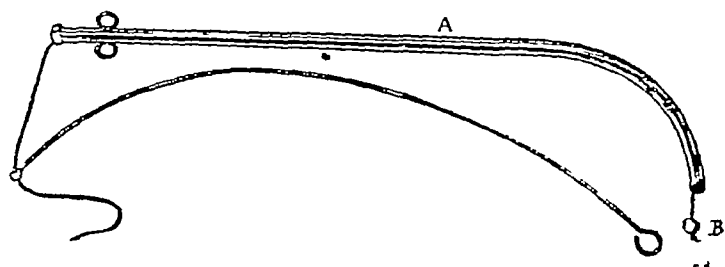


FIG 1—Author's instrument for retrograde catheterization. a metal ball (B) held in place by a thread forms the nose of the catheter (A). The thread is passed through by the stylet shown.

* The catheter if metal should have two adjacent eyes so that a needle and thread can be passed through for attachment to the rubber penile instrument

instrument or catheter is held in position by an assistant. The legs are now semi-flexed on the abdomen, and a long median or transverse incision is made in the perineum. Blood clots are cleared away, crushed tissues are excised and bleeding is controlled. The operation area always should be rendered quite dry. The instrument in the suprapubic wound is seen coming through the proximal end of the rupture (Fig 2), a rubber catheter is passed through the penile portion, and both instruments are joined by a stitch (Fig 3). The suprapubic catheter is withdrawn, carrying the

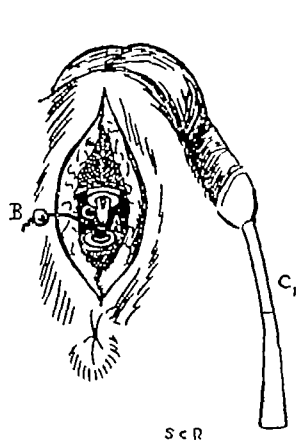


FIG 2 — The instrument is exposed in the perineum coming through the proximal end of the rupture (A). The ball (B) is cut off and the thread stitched to the rubber catheter (C).

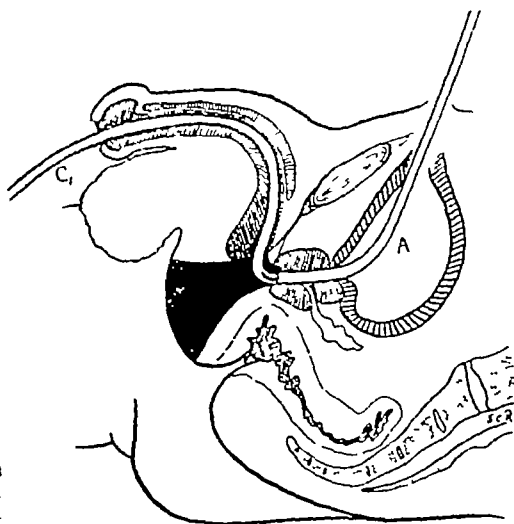


FIG 3 — The rubber catheter is pulled by the thread into contact with the metal instrument and the latter is withdrawn.

rubber catheter with it into the bladder. A long thread is attached to the end of the rubber catheter now in the bladder and this thread is pulled through the suprapubic wound, and secured to the skin or drainage tube. The catheter is anchored in this way. Four or five fine catgut sutures are used to unite the ends of the ruptured urethra over the catheter in the perineum. "Bipp" is smeared lightly into the recesses of the wound and the skin is closed with superficial drainage. A tube is left in the bladder and the end of the bed is raised.

to assist suprapubic drainage (Fig. 4). Each day after operation the bladder is gently irrigated through

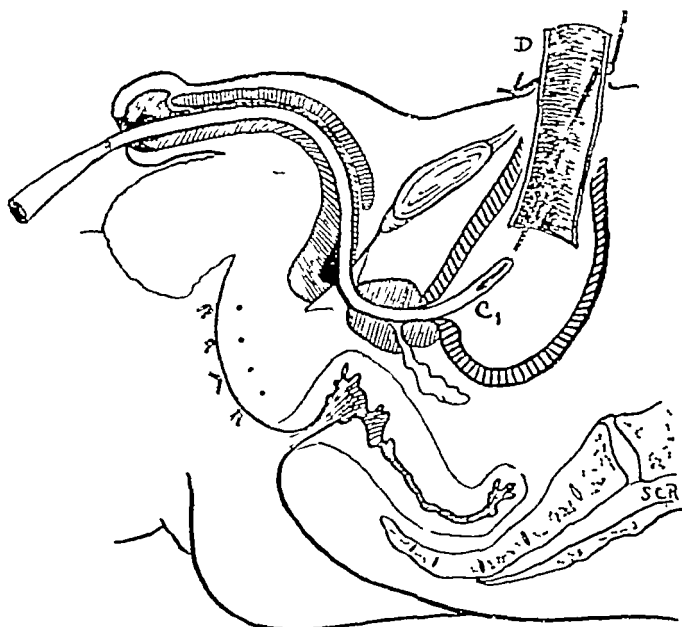


FIG 4.—The rubber catheter is pulled through the rupture and anchored to a suprapubic drainage tube

the retained catheter. Once every four or five days it is changed by attaching a fresh one to the meatal end of the one in use, and pulling the catheter which is *in situ* through the suprapubic wound by means of the attached thread. At the end of a fortnight the retained catheter and suprapubic drain are discarded. Occasionally there is leaking from the perineal wound, but usually both wounds are healed and the patient is passing water normally within six weeks.

The patient should be seen occasionally to make certain by instrumentation that no progressive stricture is in process of formation. By employing the retention catheter for about a fortnight and substituting suprapubic for perineal drainage, the following advantages are gained: (1) Nursing is simplified. (2) Scar formation in the perineum is minimized. (3) Change of catheter is simplified.

(4) Convalescence is hastened.

Bailey and others only employ the indwelling catheter when the rupture of the urethra is intrapelvic, but I have found it very satisfactory in all cases

RUPTURE OF THE BLADDER

A ruptured bladder can never be palpated, and a catheter passes freely through the urethra. In one case under the care of the writer, the catheter passed through the rupture in the bladder into the peritoneal cavity, and blood-stained urine was withdrawn in moderate quantity. This led to a delay in diagnosis. Later, at operation, it was of interest to note that when a catheter was passed with the abdomen open, the line of least resistance was through the rent in the bladder.

The bladder may be ruptured without fracture of the pelvis or, in fracture cases, quite independently of the broken bones. If the rupture is below the peritoneal reflection it will be found sometimes in an accessible position in front, sometimes low down out of reach in the region of the trigone. If the rupture is above the peritoneal reflection it will be located as a rule, either in the fundus or posteriorly. Intra-peritoneal rupture is the more common.

Whether the urine is extravasated into the space of Retzius and towards the anterior abdominal wall, or freely into the peritoneal cavity, the symptoms of the inevitable toxæmia may be delayed for one or two days.

Extravasation of urine following trauma to a healthy bladder is a very different matter to that following ulceration and rupture of the urethra behind an old-standing stricture. In the latter case the leak is followed rapidly by cellulitis, rigors and high temperature. The diagnosis is not difficult. As in the case of ruptured urethra there is an irresistible but ineffectual desire to pass urine. A catheter can easily be intro-

duced through the urethra, but a very little blood-stained urine is the only reward. The small amount withdrawn is significant if the patient has not passed water for some hours before the accident.

Later the nature of the case becomes increasingly clear by the local rigidity, the onset of vomiting, and other evidence of commencing peritonitis.

Operation—It is unwise to waste time in making a suprapubic incision of small dimensions in the hope that the rupture may be extraperitoneal. Not only is the intraperitoneal rupture more common, but if the opening is found below the peritoneal reflection, the empty bladder and the extravasated urine and blood makes it difficult to locate. Ample room is required. The intestines are packed off, the table is tilted and a good view of the pelvic viscera is secured. Blood and urine should be removed by suction if a suitable apparatus is available. The rupture in the bladder is sutured in two layers and the line of suture covered by an omental flap⁵ (Fig 5). A

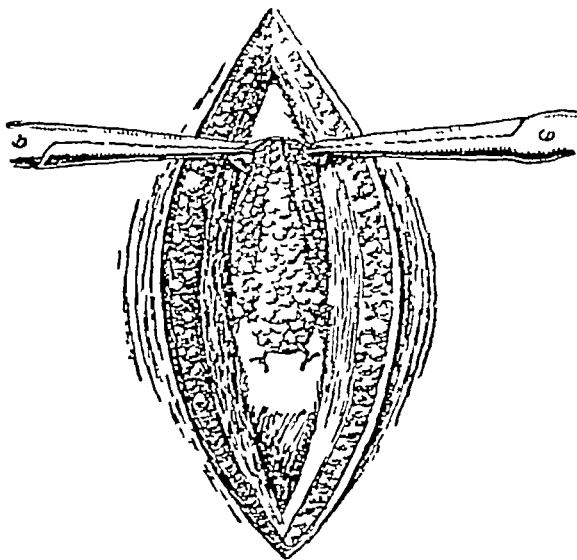


FIG 5 Omentum covering the sutures in ruptured bladder (From "Operative Surgery," London Baillière, Tindall & Cox.)

small drain is passed to the line of suture, but as a rule the bladder need not be directly drained. A self-retaining catheter, however, should be employed for a few days and no distension allowed during the first fortnight. When suture cannot be properly carried out, or when bleeding is free, drainage of the bladder is the safest procedure.

Prognosis — If after pelvic fractures, the result of great violence, a patient succumbs, his death follows extreme shock and multiple visceral lesions or is the result of injuries in regions remote from the pelvic fracture. If a patient survives his injury a couple of days the future outlook is often good, and many patients will be able to return to hard work after the lapse of six months to a year. This applies to all fractures of the pelvis whether simple or complicated.

Treatment of the fracture — When the pelvic girdle is broken in front and behind, the treatment depends upon whether there is gross displacement or whether the fragments lie in good position. If there is displacement the patient is anaesthetized and an attempt is made by manipulation and traction to bring the fragments into good position. Reduction may be very successful at the first attempt, or it may be necessary to restore the alignment gradually by heavy traction. Considerable success follows immediate manipulation, but a residue of deformity frequently remains to be corrected.

As in fracture of the long bones, the prognosis depends upon the success of reduction. By traction on the leg, the side of the pelvis which has slipped upwards can be brought down. An assistant exerts vigorous extension while the surgeon, guided by the X-ray picture, attempts reduction by manual efforts. Traction should be maintained afterwards through the medium of a Thomas splint bent at the knee. The hip is also flexed during the after-treatment to relax the muscles. Fixed traction will not succeed for

obvious reasons. It is a pull on the side of the pelvis at which the surgeon aims, and this can only be accomplished by weight and pulley. A weight of twenty pounds attached to the end of the splint is usually sufficient. Counter extension is obtained by raising the end of the bed. A Thomas splint is applied to the leg on the sound side and slung to facilitate nursing. Pin or tongs traction is most effectual in the gradual reduction of upward pelvic displacements. One of the many varieties of steel pins should be hammered through the tibia just behind the attachment of the ligamentum patella. A stirrup is applied to the pin in the same way as when skeletal traction is employed for fractures of the femur. The Thomas splints act merely as cradles for the legs when pin traction is employed.

To steady the two sides of the broken pelvis, and to correct "spreading" of the pubic bones at the line of the symphysis, a strong girth is tightly strapped in position round the pelvis between the trochanters and the iliac crests⁶. Cords are attached to two lateral rings in the girth and are passed over pulleys on a Balkan frame. A cross handle is attached to the cords in such a way that the patient can assist in raising himself in the bed for nursing purposes, as he does so the girth automatically tightens (Fig 6).

If there is little or no displacement, or if the displacement can be corrected by the first manipulative efforts, fixation of the patient on a double Thomas frame leaves nothing to be desired. Jones' abduction frame is also admirable when extension is indicated. Whatever apparatus is used, extension should be applied for six or eight weeks.

Peabody³ reduces gross displacements in cases of "disruption" of the pelvis by tying the patient's foot to the end of the table and tilting the table into the extreme Trendelenberg position.

Careful manipulation of the pelvis with the patient

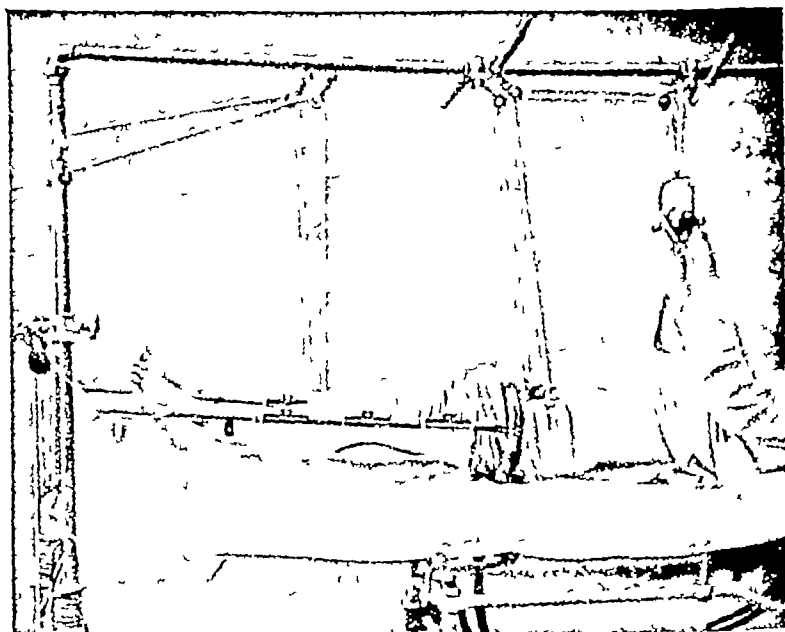


FIG 6 — Traction is exerted through the medium of Thomas splints. The pelvic girth is in position. The patient is assisting in lifting himself. The bed should be raised at the end and the splints bent at the knee. (From "Injuries to Bones and Joints," London: Baillière, Tindall & Cox.)

in this position may bring about reduction. The manipulations are carried out by Peabody under the guidance of the fluorescent screen. The patient is subsequently treated on a Bradford frame with a twenty-pound extension on the leg of the affected side. Incidentally, this writer states that there are only sixty-five cases of disruption of the pelvis mentioned in the literature. Visceral complications are rare in such cases, but fractures of the transverse process of the fifth lumbar vertebra are not uncommon.

The two X-ray photographs here reproduced (Figs 7 and 8) show such a case recently under the care of the writer. The right sacro-iliac synchondrosis was disarticulated, the pubic joint was torn open, the pubic arch was broken on the right side, the coccyx and several lumbar transverse processes were also fractured. The left side of the pelvis was displaced upwards. Treatment along the lines suggested above restored the positions of the displaced fragments and resulted in a good recovery. The patient (a nurse) was run over by an omnibus. The shock was so great



FIG 7 — Disruption of the pelvis. The sacro iliac joint on the left is dislocated. The pubic joint is torn open. The inferior ramus of the pubis is broken on the right. The coccyx and several transverse processes were also fractured.

that no treatment of the fracture was attempted for ten days. She was able to resume her duties within twelve months.

In contrast to such cases, a fracture of the pelvic girdle in front and behind may escape recognition until demonstrated by X-rays. I have seen a case in which the ilium was split from the lower angle of the sacro-iliac joint to the middle of the crest. The pubic arch was broken above and below the obturator foramen on the opposite side. The signs and symptoms after the accident (overturning of a motor-car) were quite negligible. The patient could move her legs freely, there was no shortening on measurements from the umbilicus to the ankle, the crests of the ilium were in normal position, pressure caused no discomfort. She was kept in bed for six weeks without any fixation apparatus. She reported after two months that she danced all night, galloped on horseback and could do



FIG 8 —Disruption of the pelvis Same case after the displacements have been reduced by manipulation and traction

anything she ever did before

Of the isolated fractures of the pelvis which do not break the pelvic ring, I found two cases of fracture of the acetabulum of interest Both were "text-book" varieties

In the first, there was a dorsal dislocation of the hip with fracture of the posterior rim of the acetabulum The diagnosis was made simple by the fact that each time the dislocation was reduced the head of the bone again left the socket when manual extension was released Extension was in consequence maintained until a Thomas splint was in position with the tapes firmly tied to the lower end The patient was allowed to walk with the aid of a caliper after six weeks No limitation of movement or disability resulted

Such cases are rare; the treatment is simple and satisfactory The second case was a fracture of the floor of the acetabulum with dislocation of the head of the femur into the pelvis The diagnosis of such

a condition is not easy. Movements are restricted in every direction and there is severe pain. Shortening is insignificant. An impacted fracture of the neck of the femur may be erroneously suspected.

In cases of fracture the trochanter is prominent and greatly broadened, but when the head of the femur is driven through the floor of the acetabulum the prominence of the trochanter is found wanting. For the reduction of such a condition spinal anaesthesia is recommended. Free movements of the femur are employed first to disengage the head, then powerful traction is exerted. Lateral traction in addition to direct traction will be found of assistance. After reduction the case is treated as if for fractured femur with the Thomas splint and preferably skeletal traction. When applying skeletal traction to a case of this kind, i.e. when there is no fracture of the femur or detachment of one side of the pelvis, it is best to pass the nail or pin through the femur not through the tibia. In this way, the ligaments of the knee joint are saved from stretching. On the other hand, when there is a fracture of the femur, or when the side of the pelvis is detached, a pull on a nail below the knee does not loosen the knee joint and has many advantages over femoral extension.

Fractures of the ilium alone splint themselves. The bone is invested by muscles inside, outside, above and below. The patient should be kept in bed for a couple of weeks and then allowed to go about with an encircling pelvic support of the corset variety.

Fracture of the ischium is rare. In simple cases there is no treatment except rest. Occasionally such fractures involve the acetabulum and the head of the femur is drawn with the fragment towards the sacrum. The sciatic notch may be partially obliterated. Heavy weight and pulley extension following preliminary manipulation is the most obvious treatment.

Fracture of the sacrum—This occurs usually from

direct violence such as a kick from a horse. I have seen a case of transverse fracture in a child of 12. She fell from a swing on the sacral region. The fracture was discovered by X-rays three weeks after the accident. The coccyx was also broken and caused some local pain. When there is displacement pain is severe. If there is much displacement defæcation and urination may be interfered with by direct pressure or by nerve involvement.

Finally, it is good practice to administer thyroid extract in daily doses of two grains in cases of severe fracture of the pelvis as a prophylactic against pulmonary embolus. Walters⁷, of the Mayo Clinic, has pointed out that the incidence of embolus is reduced in general surgery by this simple precaution. There have been many cases of death from embolus after injury to the bladder, urethra and pelvic veins.

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Traumatic Dislocation of the Hip

By ARTHUR ROCYN JONES, M B, B S, F R C S.

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THE structure of each part of the body is an expression of its function, and no two comparable regions illustrate this principle better than the great enarthrodial joints, the hip with its deep cup enveloping the round head of the femur is designed for stability at the expense of mobility, whereas the reverse obtains at the shoulder with its large humeral head and small shallow glenoid cavity. This inherent stability of the one joint and instability of the other explain why dislocation of the shoulder is a common casualty, whereas that of the hip is an uncommon one. Steinke, who investigated the surgical records of the Episcopal Hospital at Philadelphia during a nine-year period, found only ten cases of traumatic dislocation of the hip amongst 6,000 surgical injuries. It is possible that with the rise of accidents due to increased transport facilities this figure may be higher.

Although dislocation of the hip is still one of the rarer experiences of medical practice, the treatment of this gravely crippling condition may present considerable difficulty. The prevailing lesion at the hip region due to sudden violence is fracture of the neck of the femur, and the elderly of both sexes swell the list of sufferers from such an accident. Dislocation, however, usually occurs amongst young and middle-aged men whose activity and occupation expose them to the chances of the disruptive force necessary for the dislodging of the femoral head. The luxation generally occurs when the thigh is suddenly abducted and the

joint or paralysis of muscles. Active movement at the hip is almost absent, and passive movement much restricted. The deformity of the limb is apt to be less pronounced in the sciatic dislocation.

Anterior dislocation—In anterior dislocation the thigh is flexed, abducted, and externally rotated. The limb is not short, it may even be lengthened. The head may be seen and felt in the groin, and sometimes there is pain due to pressure on the anterior crural nerve.

TREATMENT

The patient should lie on blankets placed on the floor and a general anæsthetic administered to obtain relaxation of muscles. There are several methods of reduction, but the following are amongst the simplest. In all the thigh is held flexed during the manipulations, and an assistant should fix the pelvis.

(1) *Gravity method of Stimson*.—In this method the minimum force is employed, and it is possible to carry it out without anæsthesia. The weight of the limb is the means of traction employed to overcome the resistance of muscles. The patient is placed face downwards on a couch or table with the lower limbs projecting over the end. The hanging limb after a time will bring the head close to the point of exit from the joint, and may actually reduce the dislocation. To aid the procedure, the knee is bent and the surgeon exerts pressure downwards on the calf of the leg. This method is not so uniformly successful as the ones to be described, but when effective it is the least damaging to soft parts, and can always be tried in patients for whom an anæsthetic is undesirable.

(2) *Direct method of Allis*—Flex the thigh and knee; this brings the head near the point of exit from the joint. With the hands under the leg below the knee, lift upwards in the axis of the thigh. If reduction fails on this manoeuvre, then rotate inwards and lift,

and gradually extend, a second assistant at the same time exerts pressure under the great trochanter

(3) *Circumduction method of Bigelow*—Flex the hip and knee With the hands under the leg exert strong traction along the thigh as in the previous method, at the same time adducting and rotating the femur inwards by circumduction If this fails reverse the circumduction, by abducting and externally rotating, and end the movement with extension of the hip

Treatment of anterior dislocations—(1) *Allis's method* Flex and abduct the thigh and exert traction along the shaft of the femur by pulling on the flexed knee, at the same time an assistant pushes the head outwards Then adduct, and the head should slip back into the socket (2) *Bigelow's method* Flex the thigh and apply traction whilst abducting the limb, then adduct and rotate strongly inwards, ending up with extension The movements should merge into one another, producing circumduction

After-treatment.—Once reduction has occurred there is little tendency to re-dislocation unless there is a complicating fracture of the rim of the acetabulum Therefore in the uncomplicated dislocation little after-treatment is required The legs should be tied just above the ankles to prevent abduction; at the end of ten days slight active movements should be permitted and the limbs tied together at night This regime should be kept up for three weeks when a little weight-bearing, first with crutches, should be permitted At the end of five weeks restoration of function should be complete

In fracture of the edge of the acetabulum there is great risk of re-dislocation In this class of case after reduction of the dislocation, the pelvis and lower limb should be incorporated in plaster of Paris in abduction for six or eight weeks At the end of this time the plaster is removed and the patient allowed active movements in bed for another two weeks before weight-

The Treatment of Fractures of the Femur

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FRACTURES of the femur are best considered under three groups: those affecting the upper end, those of the shaft of the bone, and, lastly, those of the lower extremity. The treatment and difficulties in each case are different

FRACTURES OF THE UPPER END

The commonest in this group is the so-called "intra-capsular fracture," or fracture of the neck of the femur. Among elderly people this is one of the most frequent, the most serious and worst treated fractures in the body. Non-union so often results that it has been regarded as inevitable and the patient doomed to become permanently crippled. This non-union has been attributed to three reasons: the age of the patient, as it usually occurs in old people, lack of blood supply to the broken-off head of the bone, and the presence of synovial fluid. These may be contributory factors, but they are not the cause. Failure to reduce, and afterwards to fix the fracture, is the cause of non-union in the majority of cases. Except in the rare event of true impaction, unless these measures are carried out successfully, union is impossible, and no further cause need be sought to explain the failure to obtain a satisfactory result.

The appearance of impaction as seen in an X-ray film should be distrusted. A lateral view of the hip joint cannot be taken, and backward displacement or rotation of the neck below the fracture will not be appreciated in an antero-posterior view. Good stereo-

scopic photographs will demonstrate the true state of affairs but, in most cases, so soon after the injury it is neither wise nor, indeed, possible to send the patient to have such pictures taken. A portable X-ray will show the fracture, but clinical examination must be relied upon to decide whether firm impaction is present or not. If the leg lies with the foot turned outwards and there is pain on attempted movement of the hip joint, with inability to rotate the leg, then impaction is not present, and the fracture must be set if it is ever to unite.

In patients of very advanced age, in those whose health is such that a prolonged anæsthetic would be dangerous, or where the mental condition is unsatisfactory, any attempt at achieving firm union may have to be abandoned, and this should be made quite clear to the relatives. In such cases the limb should be steadied between sandbags and, as soon as possible, the patient got up into the sitting position and afterwards into a wheel-chair. Later, a weight-bearing appliance may enable the patient to move about unaided. If weight is taken off an ununited fracture the leg will become increasingly short, due to riding upwards of the shaft and this, with the accompanying adduction and eversion deformity, will produce pain and increasing disability. The appliance, therefore, should be worn for a year or more, until such fibrous tissue as may have formed has become really strong and able to withstand the weight thrown upon it. This line of treatment can, at best, only lead to a poor result with a varying degree of disablement. Therefore, unless absolutely contraindicated, the fracture should be set and fixed with a view to obtaining bony union with complete restoration of function.

Many operations have been devised to secure this result, such as fixing the fragments together with a bone graft or an ivory peg. Although successful in skilled hands and perhaps more certain in its results,

thus diminished, and this is an important argument in favour of this method of treatment. At least once every day the patient must be turned on to his face. With practice and the co-operation of the patient this can be managed by one person. The abducted leg which is in plaster acts as a lever with which to swing the patient over. This change of position enables the back to be attended to, prevents hypostatic congestion of the lungs, and is a welcome change to the patient. An overhead frame greatly facilitates nursing. Almost any pattern will do, and they can easily be

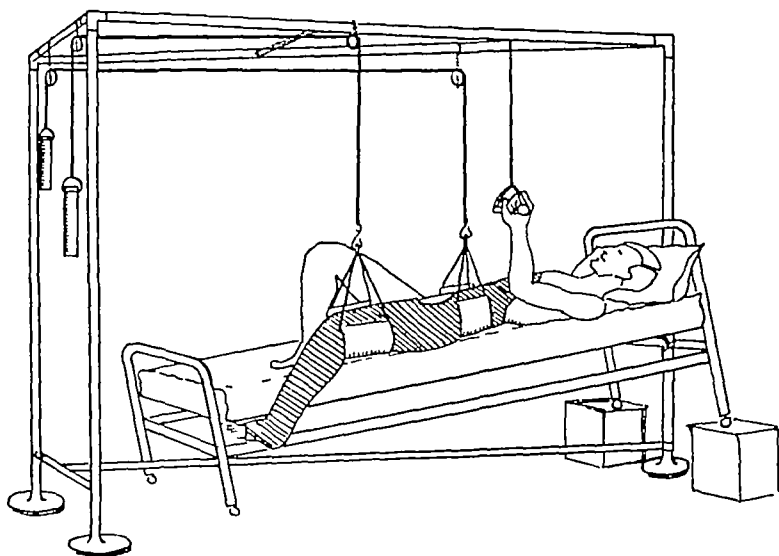


FIG 2—Method of suspension of plaster case

hired. Two webbing slings are made, one to support the plastered leg beneath the knee and the other to go round the waist under the pelvic part of the plaster. These can be readily hooked to counterbalancing weights, and the patient, by means of his arms and sound leg, can raise himself well above the mattress. The physical effort is beneficial and a certain amount of independence from the assistance of others is secured.

The hip plaster must be retained for three months and during this time the knee becomes very stiff,

especially in rheumatic subjects. In order to minimize this it is a good plan to cut the plaster off the front of the foot and leg to just above the knee and to retain it as a kind of lid. Each day it can be removed and the leg massaged and the knee-joint moved from the position of 30° of flexion to full extension. All twisting movements which might throw strain on the fracture must be avoided and the plaster lid strapped back between whiles.

Usually after about a week or so the patient becomes quite accustomed to the routine of lifting and turning and settles down to the tedious, but not uncomfortable period of three months. At the end of this time the plaster is cut—an easy matter if proper shears of the Stille pattern are used—and removed. A further X-ray examination should then be made to check position and progress of union. As in other intra-articular fractures new bone formation is very scanty. The only positive X-ray evidence of union occurs at a much later date and is shown by increased density and restoration of trabeculae across the fracture line.

Having completed the three months in plaster a further month is spent in bed, but during this time the limb is left quite free from splints of any kind. The leg as a whole will be found to be in a poor state. It is probable that the lower part of the limb will be rather swollen from venous stagnation, the muscles, especially the quadriceps, will be wasted, and the knee is sure to be somewhat stiff and painful. Movements of the hip, on the other hand, are usually quite free and painless. During this month, therefore, daily massage for the whole limb, active and passive movements for the knee, ankle and foot, and also faradic stimulation of the quadriceps should be given. The hip must be left alone. The leg should be well cradled to permit freedom and the patient encouraged to persevere with active movements. If the overhead frame is retained a sling and pulley can be rigged up to

flex the knee, and this can be worked by the patient himself.

Meanwhile measurements are taken for a weight-bearing walking appliance. The simplest and by far the cheapest type is the ordinary caliper splint with a ring fitting beneath the tuberosity of the ischium and side irons attached to a socket in the heel of the boot. Although efficient, this is not nearly so comfortable or convenient as a more expensive appliance built on the same principle. In place of the ring is a moulded leather "bucket" made from a plaster cast and laced in front. The side steels have joints at the level of the knee and a lock to fix them in full extension. On sitting down the patient can release the catch and bend the knee. In place of the heel socket, the side steels end in a sandal, to which the foot is tightly laced. This slips into a shoe of ordinary appearance. The best type of instrument of this description may cost as many pounds as the simple caliper costs shillings, but there is a fairly good range in between. In any case, a moulded thigh-band is preferable to the ordinary caliper ring and is not much more expensive. Unless carefully adjusted for length any of these instruments will fail in their object. When standing the patient should have the sensation of sitting on the ring or band, with no weight on the heel.

At the end of the fourth month, therefore, the patient commences walking with his instrument. Different opinions are held as to the length of time the support should be worn. Too early weight-bearing has ruined many promising results. Consolidation of the fracture is so slow and the mechanical strain on it so great that it would be wise to set the length of time at not less than six months. In old people, or where the X-rays show delayed or doubtful union, this should be extended up to a year. Even if bony union is not achieved, a close, firm, fibrous union will give a good weight-bearing hip-joint and a satisfactory functional

result; but only if it is well protected from strain at the commencement

The present view, therefore, is that fractures of the neck of the femur should not be regarded with the pessimism of former times. Treatment by reduction and fixation in plaster will, in the majority of cases, achieve bony union and complete recovery of function. The treatment is tedious for the patient, requires most careful supervision, and takes from ten months to a year; but the results and the grim alternative of serious lameness make this amply worth while.

Little need be said of the other common fractures of the upper end of the femur. Those close to or through the trochanters all join up readily. Much separation of the fracture is unusual, but adduction of the lower fragment is fairly constant. Therefore any form of extension which allows of abduction of the limb as a whole will meet the case

FRACTURES OF THE SHAFT

Fractures of the shaft of the bone present an entirely different problem. As a rule union occurs readily, and the chief difficulty is to obtain approximate end-to-end apposition of the fragments. Considerable overlap is usual, and reduction is resisted by the contraction of the powerful thigh muscles. Except occasionally in small children, setting of the fracture under an anæsthetic, followed by fixation in splints or plaster of Paris is not possible. Overriding or angulation will almost inevitably occur. This difficulty in maintaining reduction has encouraged the use of internal splints, such as metal plates. Although the prospect of fixing the fracture once and for all by means of an operation may be attractive, yet the method is one that should be strongly condemned. Unfortunately, it is still widely practised, especially by those who are called upon only occasionally to deal with such fractures. Examples of bad results are only too common.

In the first place, if the operation is undertaken as a primary measure the limb is not in a fit state for surgical interference. At the time of the injury considerable damage to the soft parts, as well as to the bone, is inevitable, and, in consequence, there is a mass of devitalized tissue and extravasated blood. Moreover, the skin may not be in a fit condition for operation. Even with the most scrupulous technique the danger of infection is quite appreciable if the operation is performed at this time. Furthermore, the introduction of a foreign body definitely delays union, and may often promote the formation of a pseudarthrosis in a fracture which clearly would have united quite readily by non-operative measures.

Lastly, the application of a long plate requires a big incision, the division of many blood vessels, and wide separation of the soft parts away from the bone. In consequence of this and of the presence of a foreign body, the thigh muscles, and especially the quadriceps, become adherent and fibrosed, and stiffness of the knee-joint, which cannot be overcome by physical treatment, ensues. It is found, therefore, that non-union and stiff knees are a common sequel to the operation of plating these fractures. In very exceptional circumstances only should the method be employed.

Fractures of the shaft are best treated by strong continuous traction combined with support and lateral counter-pressure at the site of the fracture. There are many ways of carrying out this, but all of them require frequent adjustment and supervision. The Thomas splint, with overhead suspension from a frame, is in very general use, but the mode of applying extension to the limb varies, and it is in this respect that progress has been made. The usual skin extension by means of adhesive strapping may prove adequate, but, on the other hand, has great disadvantages. It is liable to become loose to some extent, and the

period of extension is finished. Reapplication may be difficult if the skin has become sore and blistered. Again, in a strong individual sufficiently heavy extension by this means may not be possible. Lastly, the knee-joint frequently suffers. Stiffness is often unavoidable and may take many months to overcome and, since the pull is through the joint, the ligaments may become relaxed and leave a rather loose joint.

These disadvantages are largely overcome by "skeletal traction" A steel pin, wire or "ice-tongs" can be applied to one of the bones below the fracture and a far more efficient pull exerted. Piercing the bone and leaving a metal instrument protruding through the skin may sound a dangerous procedure, but with proper care no trouble need be anticipated.

Method—X-ray photographs of both antero-posterior and lateral views should be taken; one view is not enough and may be misleading. The displacement is fairly characteristic according to the level of the break. Unless ample skilled nursing is available the case is better treated in an institution rather than in a private house. Most of the apparatus can easily be hired from any of the big surgical supply firms. In the average case a Thomas splint with a suitable sized ring, and a Balkan frame with cords, pulleys, and weights will be required.

The lower part of the thigh and knee are prepared as for a surgical operation. The splint, fitted with flannel slings, and the rest of the apparatus must be absolutely ready for application. The patient is then given an anæsthetic. Gas or a local anæsthetic is sufficient, although a full and more prolonged anæsthesia may make things easier from the surgeon's point of view. With full aseptic precautions, as for an ordinary operation, a Steinmann rustless steel pin is then fixed in position. To do this a small snick through the skin is made with a scalpel just above the level of the adductor tubercle of the femur on the outer side.

Then, drawing the skin slightly upwards, the point of the pin is introduced and thrust straight down to the bone. By means of the special handle the pin is made to transfix the bone and the end is brought well through the skin on the opposite side. Sterile gauze is packed round the puncture holes and bandaged firmly into position. This dressing should not afterwards be touched.

The Thomas splint is slipped over the leg until the ring reaches well up into the groin and the special stirrup attached to the ends of the pin. From this

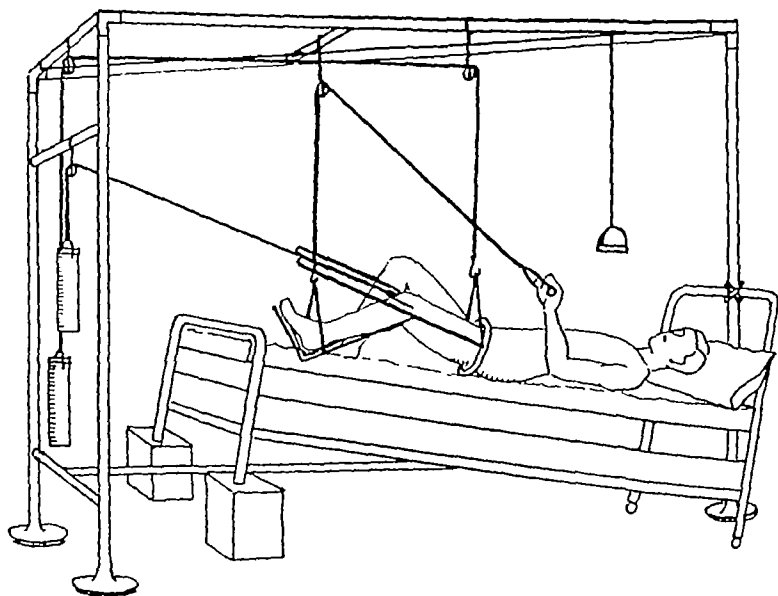


FIG 3 —Method of extension and suspension used in the treatment of fractures of the shaft of the femur

stirrup a cord passes to the end of the splint, where it is made fast. The leg and foot are supported with the knee flexed on a hinged attachment to the Thomas splint. The foot of the bed is raised on blocks, and weight extension is applied to the end of the splint itself. This, through the cord and stirrup, exerts traction directly on the lower end of the broken bone and, at the same time, withdraws the ring of the splint from the groin and relieves any pressure. The limb

and splint are counterbalanced by means of the weights attached to the overhead frame so that the patient can lift and move about without disturbing the fracture.

No immediate attempt is made to reduce the displacement. Under the weight-extension the muscle spasm goes and, in a day or two, it will be found by measurement that the overlap has been corrected. The lateral displacement must then receive attention. If the upper fragment is abducted, as usually occurs in fractures of the upper third of the shaft, then the lower part must be made to follow it by abducting the whole splint. The lower fragment is usually tilted backwards, and this must be corrected by a supporting band slung from the side bars of the splint. Similar slings of varying tension support the rest of the limb. The most important of these is the one beneath the fracture itself. The fracture is apt to sag backwards unless this band is kept tight.

As over-lengthening may occur, measurements of the two limbs need frequent checking and the weight adjusted accordingly. At the end of six to eight weeks union should be sufficiently firm to allow the weight extension to be given up. The pin is, therefore, withdrawn, but the rest of the splint forms a convenient support for the leg for the remainder of the recumbent period.

The great advantage of this pin traction is that from the very commencement of treatment the knee can be kept moving. In addition, the thigh is exposed, so that massage and faradic treatment for the quadriceps muscle can be carried out from the beginning. The period of convalescence, therefore, is greatly shortened. At the end of from ten to twelve weeks the fracture should be strong enough to permit protected weight-bearing. A caliper splint as previously described is therefore fitted. It should be worn for not less than three months as angulation through bending of the soft callus is very apt to occur.

Operative treatment should be reserved for cases of delayed or non-union. Delayed union, in most instances, is due to the intervention of soft tissues between the fragments. In such cases, clearing the ends of the bone and locking them together by means of an intra-medullary peg of autogenous or beef bone will usually lead to union. It is not safe to depend on the peg to hold the alignment as angulation readily occurs. Pin traction should, therefore, be applied at the end of the operation

FRACTURES OF THE LOWER END

These fractures usually involve the knee-joint and, therefore, the consequences may be serious. Unless accurate replacement of the fragments is secured, the articular surfaces will lose their normal relationship, and in consequence pain, stiffness, and, later on, osteo-arthritic changes will ensue. For these reasons, if manipulative or extension methods fail, then operative treatment should be undertaken without delay.

The commonest injury of this kind is the inter-condyloid or T-shaped fracture. It amounts to a supra-condylar fracture in which the shaft has been driven downwards separating the condyles. Accurate reduction is difficult. The best method is to insert a steel pin through the crest of the tibia and apply strong traction with a Thomas splint. If this does not bring the condyles together then a screw clamp should be applied under an anæsthetic. This must be kept on for a few moments only, otherwise sloughing of the skin may occur. If this measure fails then the only course will be to operate and screw or bolt the condyles together.

Sometimes a fracture of one of the condyles occurs. In such cases extension treatment is not necessary, and under an anæsthetic it is possible, as a rule, to manipulate the fragment into good position. The knee should then be fixed in a close-fitting plaster of

Paris case and weight-bearing forbidden until the fracture has become firm.

Lastly, mention should be made of fracture-separation of the lower epiphysis. The displacement is usually forwards and is produced by violent hyperextension of the knee, such as may occur in a heavy tackle at football. The nature of the injury may not be obvious to begin with, owing to the great swelling of the knee, but it should be seen that the tibia lies on an anterior plane to the femur. The lower fragment rotates in its passage forwards and becomes locked in front of the end of the shaft. If treated soon after the injury reduction may be accomplished by manipulation under a deep anæsthetic. The knee is forcibly flexed and, at the same time, the upper part of the leg is pulled forwards by a traction band. If more than a week is allowed to elapse it may be necessary to effect reduction by open operation.

The best exposure is through a long incision along the antero-external surface of the lower part of the thigh. The rectus femoris and the vastus externus muscles are defined and the bone exposed along the line of cleavage between them. By this route very little bleeding is encountered and the fracture is reached with the minimum of damage to the thigh muscles. The lower fragment is then freed and by powerful leverage, combined with flexion of the knee, brought down into its normal position. Whether the fracture be reduced by manipulation or operation, the knee should be maintained in the position of almost full flexion for about three weeks until the danger of re-displacement is past. A convenient way of doing this is to put the limb in a loose-fitting, divided plaster case which can be suspended from an overhead frame. This should be followed by gradual extension of the knee-joint with exercises and faradic stimulation of the quadriceps muscle.

Injuries of the Knee-joint

By ROBERT OLLERENSHAW, M D, F R C S

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THE knee is the most frequently damaged joint in the body, and its traumatic lesions may be discussed under four heads in gradually increasing severity. We may therefore tabulate them as follows:—

- (1) Injuries to the synovial lining of the joint.
- (2) Injuries of the ligaments.
- (3) Injuries to the semilunar cartilages
- (4) Fractures involving the joint.
 - (a) Patella.
 - (b) Epiphyseal separations.
 - (c) Articular surfaces of femur and tibia

Fractures of the patella are dealt with elsewhere in this issue, and in the limited space at my disposal I propose to consider three other important sections of the subject, first, simple traumatic synovitis—the most common of the lesser injuries, secondly, semilunar cartilage injuries, and, lastly, fractures of the weight-bearing surfaces of the joint

Traumatic synovitis.—This is a frequent result of a small injury, such as a blow on the joint or a moderate strain. The delicate vascular synovial is crushed and bruised, or torn. There is effusion into the joint with local tenderness. The joint can be fully moved, but with a sensation of “stiffness.” The type of injury which has occurred puts out of the question any gross lesion. A period of rest with the application of an evaporating lotion is desirable for the first 24 hours. If this is persisted in for a longer time there is a very rapid weakening of the muscles which control the joint, especially the vasti, which become soft and

flabby. Intra-articular adhesions are very liable to form, and in order to avoid such occurrences it is important to take steps to prevent muscle-wasting and to encourage the absorption of the effusion.

Early massage of the thigh and knee must be instituted with active contractions of the quadriceps whilst the limb is lying extended on the couch. If the patient is not capable of making active contractions these must be artificially produced by stimulation of the muscles through a Bristow faradic coil. A well-applied bandage should be worn over a layer of wool, but the bandage must only cover the joint and must not be taken higher up the thigh in such a way as to prevent the full contractions of the muscles.

The majority of such patients will usually tolerate a certain amount of walking exercise after the first two days, and the range of movement gradually increases with the steady diminution in the effusion. By such methods the thigh is not allowed to become wasted and weakened, in contrast with the results which follow the misguided treatment of prolonged rest on a back-splint or over a pillow.

In cases where adhesions have formed in the joint and the injury has occurred not more than a few weeks previously, a vigorous course of massage and gradually increasing exercise, preceded by an application of heat, will usually be sufficient to free the joint without recourse to more forcible methods. In old-standing cases, however, a more determined attack must be made and, under a general anaesthetic so as to ensure thorough relaxation of the muscles, full flexion is performed, and it is to be remembered that flexion of the knee is possible normally until the calf meets the back of the thigh. Rotation movements must then be performed and these are to be done with the joint flexed to a right angle at which point the normal rotatory movements are greatest. As Fisher has pointed out, a common adhesion, and

one frequently overlooked, is that which forms in the synovial recess under the internal lateral ligament.

Full rotation movements will free this adhesion. Manipulation such as that described above should be followed by massage and full movement each day until complete recovery is established.

Injuries to the semilunar cartilages.—Because of its anatomical attachments and the fact that strains in a “valgus” direction are so common, the inner cartilage is the more frequently torn. Excision of an internal cartilage is a commonplace for all orthopædic surgeons, whereas it is an unusual event to have to remove an external cartilage. In diagnosis one is almost entirely dependent upon the history of the case. The primary injury must be one of some severity, although large tears can be produced by fairly simple means. I have, on a number of occasions, removed a split cartilage which has been damaged whilst the patient was rising from a kneeling position and taking all the strain on one knee-joint. A history of a twist followed by a sudden “locking” of the joint may be caused by other injuries than a torn cartilage, such as a crushing of a synovial fringe, but the sudden “unlocking” is a much more definite and conclusive sign that a cartilage has been torn. I do not advocate operation upon a knee suspected of a cartilage injury upon the history of one attack, but always advise palliative measures and observation. If a portion of the torn cartilage is being engaged in the joint, a further disturbance will occur and make the diagnosis clear. The operation needs no description here, but one must emphasize the necessity for the avoidance of all fingering of the wound. Everything must be handled in forceps, swabs and catgut especially being held in this manner. After operation it is my practice to fix the joint on a back-splint for the first twenty-four hours. After that time the splint is taken off and not replaced until after the sutures are removed and the patient is allowed

to stand, usually the tenth day. From this time movement is encouraged and massage given with faradism to the thigh.

Fractures involving the articular surfaces.—Of all the injuries affecting the knee-joint those which cause the most concern to the surgeon are the fractures of the weight-bearing surfaces of the joint. These fractures are not very common, and an examination of the records of Salford Royal Hospital, Manchester—a hospital in the heart of a great industrial area where coal-mines, docks, railway yards, and engineering works are on every hand—shows that about 250 fractures of the lower limb are dealt with in the wards each year, and of these, about 2 per cent are involving the knee-joint.

On the femoral side of the joint the usual injury is the transverse fracture of the lower end of the femur with a splitting of the condyles forming a T-shaped break. Traction under an anæsthetic is generally sufficient to restore the position of the fragments, but it may be necessary because of backward tilting of the lower fragments towards the popliteal space, due to the pull of the gastrocnemii, to flex the knee slightly and to use a bent Thomas splint. If this is needed it is better to flex the splint, not precisely opposite the joint, but at the level of the transverse femoral fracture. This throws the line of fracture forward and restores the normal "arch" of the femur.

Localized "punch" fractures—In a description of the articular fractures involving the lower end of the femur, the condition termed, by Koenig, osteochondritis dissecans, must be included. This occurs as a punched-out area of articular cartilage, with a bony base, usually from the inner condyle just at the point where the greatest impact takes place in the joint (Fig 1). In some cases this fragment is anchored by a fibrous attachment in its bed, in others it becomes loose and floats about the joint as a loose body. The

condition occurs in men with fifteen times the frequency with which women are affected. It also occurs during the most arduous time of life. For these reasons, coupled with the site of the lesion, we regard it as a fracture of the articular area. Its correct treatment is an arthrotomy and removal of the fragment

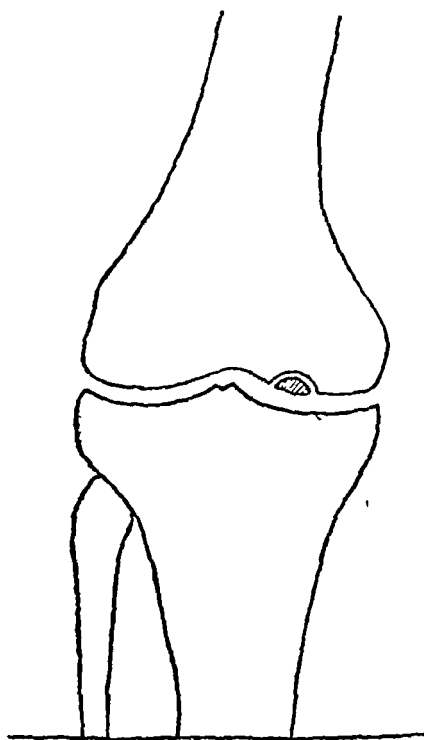


FIG 1 —“ Punch ” fracture of internal condyle

and paring down of the edges of the remaining “ crater ” A similar type of limited detachment of a fragment of articular surface is found, though much more rarely, in the tibia

Tibial fractures.—These may be divided into (1) general compression fractures of the whole upper end of the tibia, (2) separation of a single tuberosity, and (3) avulsion of the tibial spine with associated tearing of the neighbouring cartilage. The results of such injuries depend upon the reduction of the displacement. Results are so often poor because of the difficulties met

with in the reduction and by reason of the absorption of bone and cartilage which occurs in the fracture area resulting in an irregular articular surface and, later, the development of changes of an osteo-arthritic nature. Open operation is strongly indicated unless manipulation results in a really adequate replacement of the fragments. Figs 2 and 3 illustrate, by line-drawings of radiograms, a typical case of severe crush of the

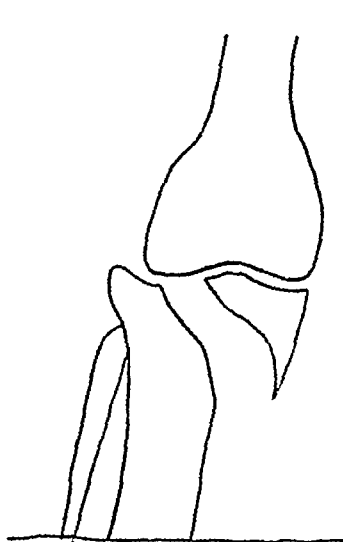


FIG 2—Fracture of tibial tuberosities with gross displacement

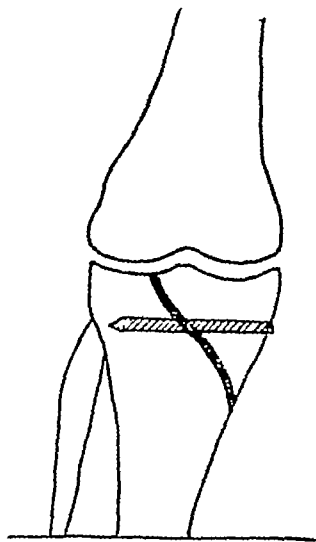


FIG 3—The same after open operation and bone pegging

tibia due to a forcing of the knee into a varus position by sudden application of great violence. The fragments were replaced by open operation and a bone pin driven through the inner tuberosity to engage the larger fragment. The end result has been excellent, a range of movement from 180° to 80° , with a perfectly stable joint, being obtained. In my experience the tibial tuberosities are broken more commonly by violence directly applied to the flexed knee or by forced abnormal lateral movement than by the so-called "compression," a term so often employed in describing the fractures of this region. The tuberosities are fractured with about equal frequency.

The fractures in the knee-joint are of such great variety that it is impossible to dogmatize in the matter of treatment and to lay down any rule as to operative or non-operative methods. Each must be dealt with according to its individual needs. All fractures into the joint must be treated at once under full anæsthesia and with all preparations made for open operation should manipulation prove ineffective

After-treatment.—A definite distinction must be made in the later treatment between movement and weight-bearing. Gently graduated movement must be of an active nature and commenced as early as possible after union is obtained. But, in the more severe injuries at least, weight-bearing must be delayed by the application of a walking caliper splint for three months.

Fractures of the Patella

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FRACTURES of the patella are fairly common, and they rarely lead to gross disability. Their diagnosis is usually extremely simple, and efficient treatment may be expected to produce perfect recovery. The complications to be feared are very definite. Perhaps the most common is non-union of the fracture, and of the aponeurotic tear which frequently accompanies it. Adhesion of the patella to the femur is less common, but more disabling. A sequel, mostly seen in elderly patients, is osteo-arthritis, while an unstable joint occasionally results from distension of the capsule with blood and serous exudate.

With a clearer conception of the pathology of the fracture and of the essentials of treatment, these complications are becoming more uncommon, and need never occur. A sharp distinction should be drawn between fractures caused by direct violence and those produced by muscular contraction. The former merely splinter the bone, while in the latter the injury to the bone is only a small part of the total lesion.

FRACTURES BY DIRECT VIOLENCE

Here the bone is cracked by a direct blow or kick. A fall on the knee rarely involves the patella, the violence being received by the tubercle of the tibia. Occasionally a single vertical fissure is present, but more often the patella is comminuted, the fissures running irregularly, or radiating in a stellate manner. The aponeurosis is intact and displacement is therefore very unusual. Some bleeding and serous effusion into the joint is usual, but a marked hæmarthrosis is

rare. This fracture is mostly of little consequence, and provided certain elementary precautions are taken, no disability should result. Rare exceptions to this are provided by fractures in which fragments are displaced into the joint, or in which the bone is grossly disorganized.

Diagnosis — There are obvious signs of local trauma in the form of swelling, well-marked tenderness, and, later on, bruising over the bone. Occasionally the fissures can actually be palpated, and in grossly comminuted fractures the patella feels curiously soft and boggy. In most cases, however, the diagnosis must be presumptive until confirmed by radiography. A lateral view should never be omitted as, without it, it is impossible to exclude backward displacement of a fragment into the joint.

Treatment — In cases of simple fissuring it is sufficient to immobilize the joint in extension for two or three weeks. The most comfortable appliance is a posterior non-padded plaster of Paris gutter, supporting the lower two-thirds of the thigh and the upper two-thirds of the leg. Walking in the plaster may be permitted after a few days, and adhesions of the patella to the femur can be prevented by daily side-to-side movements, carried out gently and commenced towards the end of the first week. After the second week, passive flexion of the knee is started. Active movements are added in the third week, while full use should be possible after the fifth week.

When severe comminution is present, and especially with displacement of the fragments, the treatment must be more energetic. If the hæmarthrosis is of any size it should be evacuated by aspiration. Local anæsthesia is then induced by injecting 10 c cm of 2 per cent. novocaine into the hæmatoma in front of the fracture, and a deliberate attempt is made to restore the bone to its normal shape; this is done by pressing the fragments together, and also against

the underlying femur. In these cases a posterior splint is not sufficient, and an anterior plaster of Paris gutter, carefully moulded to the contours of the knee, should be employed in addition. This limits further effusion, and tends to prevent re-displacement of the fragments. After a week, the anterior gutter is removed daily for gentle lateral movements of the patella. The after-treatment is then continued as above, except that walking should not be allowed before the tenth day, and movements should not be started before the end of the third week. Wasting of the quadriceps can be prevented by massage and faradism. The plaster gutters should not be discarded before the end of a month, and full use is rarely possible until at least another month has elapsed.

Open operation is only indicated in the following rare cases:—(a) when fragments are displaced into the joint, these should be removed through an incision to one or other side of the patella, (b) when the bone is grossly disorganized; here the best procedure is to remove the patella sub-periosteally, otherwise it will form an irregular bony mass which adheres to the femur, causing much subsequent disability.

FRACTURES BY MUSCULAR VIOLENCE

It must be pointed out very emphatically that the patellar fracture in this group is only an incident in a more serious lesion, this is a rupture of the quadriceps aponeurotic insertion. Failure adequately to appreciate this fact has led to many erroneous ideas on the pathology and treatment of the condition.

Occasionally, the rupture is partial, involving the patella with its aponeurotic covering, and only the adjacent parts of the vastus expansions. In such cases, the separation between the fragments is slight. More often the vastus expansions are torn right across, the rupture of the aponeurosis being complete and the separation between the patellar fragments con-

siderable (one to two inches) The aponeurotic tear usually occurs at a slightly different level from the fracture, and the torn fibres tend to curl in between the fragments, and are often responsible for non-union.

The usual cause of this injury is an attempt to recover after a slip When this happens the knee is

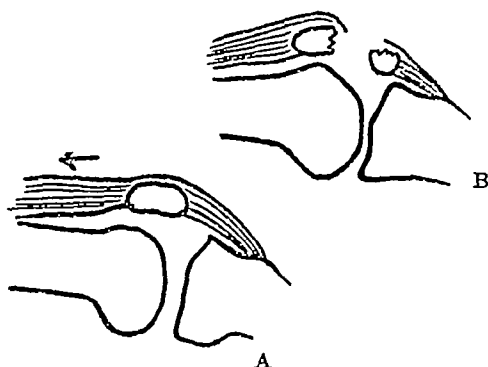


FIG 1 —Mechanism of fracture by muscular violence

semi-flexed, and the upper half of the patella is poised on the intercondylar surface of the femur, its lower half being unsupported (Fig 1) A sudden, unguarded contraction of the quadriceps, in the attempt to recover from the slip, catches the aponeurosis and

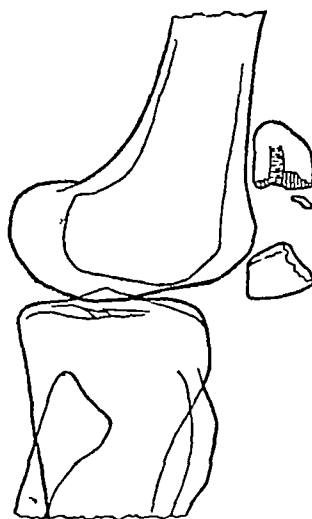


FIG 2.—Radiogram of typical fracture of patella, showing separation and also rotation of lower fragment

patella at a disadvantage, and snaps them both transversely. The patella usually breaks in its lower half (see Fig 2), but the fracture may occur at any level. Fig 3 illustrates a fairly common site, a flake of the

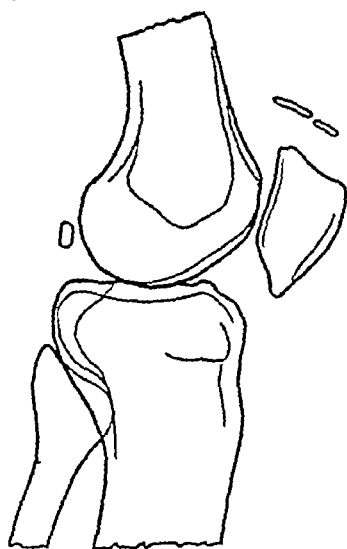


FIG 3—Radiogram of fracture of upper margin of patella, with separation of fragments



FIG 4—The same case after suture of ruptured quadriceps aponeurosis

upper border of the bone being torn off by the rectus and crureus tendons. In all cases the knee-joint is opened into, and becomes more or less distended with blood and exudate.

Diagnosis—The condition is usually very obvious. The patient can neither stand or walk, and is unable to extend his leg. There is pain and well-marked tenderness at the fracture site, and in nearly all cases an unmistakable gap can be palpated between the fragments. This gap is increased by further flexion of the knee. Distension of the joint occurs rapidly and bruising over the fracture soon follows.

Radiograms are rarely necessary for diagnosis, but they should never be omitted as they may show comminution or co-incident injury, and they might be required later as legal evidence. It should be noted that the outline of the bones tends to be somewhat

encouraged to walk in the plaster splints; this will preserve the function and nutrition of the joint and muscles, and prevent atrophy and stiffness. Gentle passive movements of the knee may be started after the third week, but active movements should not be commenced until after the fourth week, owing to the danger of re-fracture. Some limitation of flexion is to be expected for another month or two, and the surgeon must resist the temptation to hurry matters on by forcible exercises or manipulation.

Results.—Normal function may be expected in from three to six months. In old people some osteo-arthritis

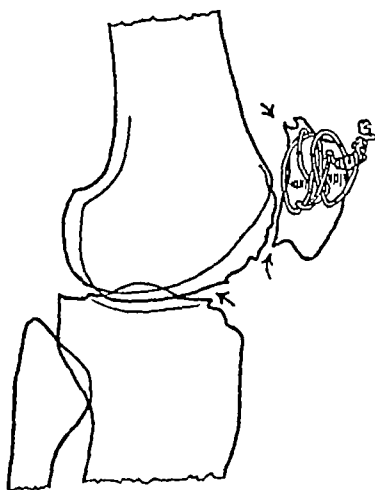


FIG 6—Radiogram showing osteo-arthritis after operation for fractured patella

frequently follows (Fig 6), but is very unlikely to do so if the fragments are fitted accurately together. Re-fracture is a distinct possibility if the fracture only is treated and the torn aponeurosis left unsutured. The writer has seen a case in which re-fracture occurred three times, each time a few months after wiring.

Conservative treatment—The above treatment produces results far superior to the best that can be expected from conservative measures. If the aponeurosis is left unsutured, a certain degree of instability of the knee is inevitable, moreover, bony union of the

fracture hardly ever occurs. Conservative treatment should therefore be reserved for cases in which open operation is contra-indicated by age, infirmity or illness

Blood and exudate must first be evacuated by aspiration. An attempt is then made to approximate the fragments and the aponeurotic edges with strapping, or preferably elastoplast, with the knee in full extension. The joint is then immobilized in this position in plaster of Paris gutters for at least four weeks. To minimize disability, side-to-side movements of the patella and massage to the quadriceps should be commenced after a week, and walking in the splints should be encouraged at the end of a fortnight.

Occasionally, a surprisingly good result is obtained. In old people the degree of disability is not great, provided the above precautions are taken. In young people, however, there can be no comparison between the results of conservative treatment and those of operation.

Fractures of the Tibia and Fibula

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UPPER END OF THE TIBIA

FRACTURES of the tibial tuberosities—These fractures, which are comparable in their mechanical after effects to fractures of the femoral condyles, may result from : (1) a compression thrust of the femur on the articular surface of the tibia sustained in a fall from a height; (2) a powerful abduction or adduction strain of the knee, (3) or more rarely, from direct violence. The fracture takes the form either of a vertical or oblique split running down from the joint surface, and cutting off the external or internal tuberosity, or a localized depression with comminution. The upper end of the tibia is broadened, and the plateau level is disturbed—a serious menace to the future of the knee-joint (Fig. 1). The clinical picture is that of a hæmarthrosis with an expansion of the upper end of the tibia; there may be a definite block to extension if the tibial spine is also detached.

Prompt reduction of the displacement is essential; the level of the tibial plateau must be restored, and a right of way secured for full extension. This is usually possible by manipulation and traction combined with a squeezing together of the tuberosities. Reduction is followed by a period of immobilization with traction on a Thomas splint. Active movements of the knee should be allowed after the third week, but weight-bearing should not be permitted before the eighth week. If accurate replacement cannot be achieved by con-

servative methods in patients in the prime of life, the affected tuberosity should be fixed by means of an ivory or "beef bone" peg. In old and feeble individuals who not uncommonly sustain this type of fracture, it may be necessary to rest content with imperfect correction. Failure to restore the level of the tibial articular surface means the certain development of arthritic changes in the knee-joint.

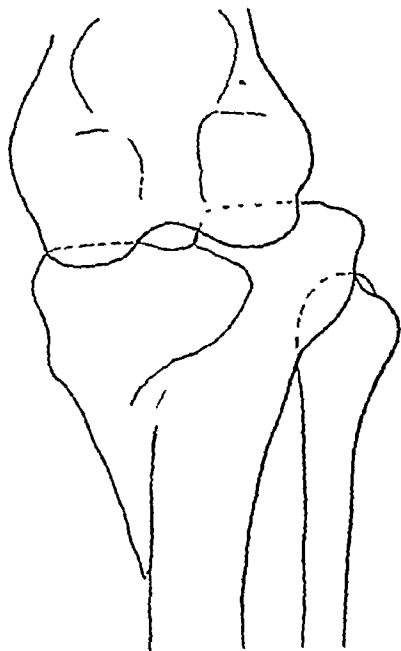


FIG 1.—Fracture of internal tuberosity of tibia with marked disturbance of the tibial plateau

Fractures of the tibial spine—Three distinct types of this uncommon but important injury have been distinguished (Jones and Alwyn Smith¹).—(1) *Avulsion of the inner tubercle of the spine*, following a forcible hyperextension of the knee, a mechanism which more commonly produces the equivalent lesion of rupture of the anterior crucial ligament. The small bony fragment is usually displaced forwards, and at once forms a block to complete extension, which accounts for the characteristic clinical sign. The knee-joint

rapidly fills with blood and effusion, and careful testing may demonstrate abnormal hypermobility of the tibia on the femur in the antero-posterior plane. The diagnosis is made certain by a radiographic examination. The obstacle to extension should be overcome by manipulation and the joint completely immobilized for not less than four to six weeks. During this time, as in all severe knee injuries, the quadriceps tone should be maintained by faradic stimulation and massage. When repair is considered to be sound, gradual mobilization of the knee by the active efforts of the patient is instituted. Any residual limitation of mobility at a later stage can be dealt with by a judicious manipulation under anæsthesia. In neglected cases where the bony block persists, the knee-joint should be explored and the obstruction removed.

(2) *Fracture of the outer tubercle*, a rare injury, is produced by the impingement of the inner margin of the outer femoral condyle on the tibial spine during a forced abduction of the knee in which the internal lateral ligament has been severely overstretched. The characteristic sign is again a blocked extension.

(3) *Fracture of the tibial spine* associated with fracture of one of the tibial tuberosities (*see above*)

Separation of the upper epiphysis of the tibia—This unusual injury is sustained by children between the ages of three and nine. The epiphysis is wrenched off and displaced forwards. Reduction is an easy matter soon after the accident, and there is little tendency to redisplacement with the knee maintained in extension. After a delay of some days it may be difficult to correct the displacement fully, and the position of flexion of the knee is likely to be required for the first ten days. Disturbance of growth, giving rise to shortening and deformity, is a possible sequel.

UPPER END OF THE FIBULA

Two types of fractures are encountered at this level—

both comparatively uncommon injuries.

(1) *Traction fracture of the styloid process.*—The fibular styloid, or a more considerable fragment, carrying with it the insertions of the biceps tendon and external lateral ligament of the knee, is sometimes detached by a forced adduction (Figs 2 and 3). This fracture may occur alone, or may accompany a dislocation of the knee-joint. Its importance lies in the fact

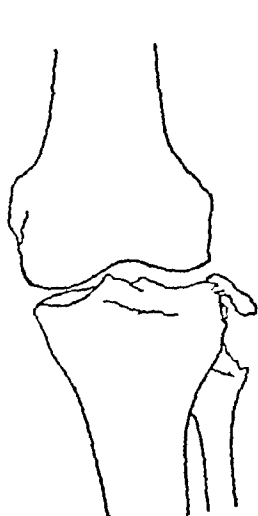


FIG 2.—Traction fracture of upper end of fibula, with external popliteal nerve involvement

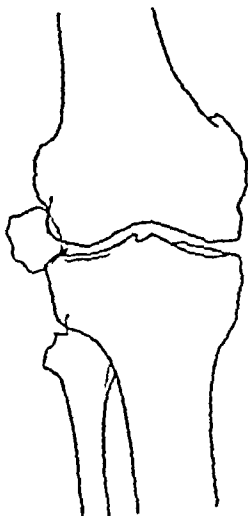


FIG 3.—Fracture of upper end of fibula with external popliteal nerve involvement

that the external popliteal nerve rarely escapes damage. The nerve trunk is either stretched or torn completely across (Platt²). The bony fragment is drawn upwards by the pull of the biceps, and may even enter the outer part of the knee-joint (Watson Jones³). Replacement by manipulation alone is rarely practicable. The bony fragment should be exposed and reattached to the head of the fibula. At the same time the external popliteal nerve should be inspected, and any necessary repair carried out.

(2) *Fracture of the neck of the fibula*—This is a trivial injury. The line of fracture is usually transverse and there is little or no displacement. Involvement of the

external popliteal nerve is rare. The disability is insignificant, immobilization is unnecessary, and walking may be allowed within a few days.

SHAFT OF TIBIA AND FIBULA

Fibula—Isolated fractures of the shaft of the fibula are uncommon and unimportant. Displacement is slight or absent, and the clinical signs suggest little more than a simple contusion. Strapping or a light ambulatory plaster should be applied, and weight-bearing allowed after a few days.

Tibia.—Fracture of the tibial shaft is a common injury in children and young adults. The oblique or spiral fracture of the mid-shaft resulting from a torsion violence is the predominating type. As the fibula remains intact, the displacement is often small, but occasionally in the adult considerable overlap and angulation may develop. In these circumstances the intact fibula may hinder accurate reduction.

In the majority of cases where the displacement is negligible or easily corrected, the fracture can be effectively controlled in an accurately fitting plaster of Paris cast extending from the toes to the mid-thigh. An iron stirrup should be incorporated in the lower part of the plaster on which weight can be borne with comfort at the end of a week. In the average case union is seen in from four to six weeks; in older people union may be slow.

Where the initial displacement tends to recur and the upper fragment projects dangerously beneath the skin, open reduction and fixation are indicated, the fracture being secured by a Lane steel plate adjusted to the natural tibial curve.

Combined fracture of the tibia and fibula—These injuries are familiar at all age periods. The common site of fracture is at the junction of the middle and lower thirds. When produced by direct violence the bones break at the same level, and usually with com-

minution. In the considerable number of fractures due to lateral bending or a torsion force, the fibula gives way at a higher level. Displacement of various types may be seen; forward projection of the upper tibial fragment; external rotation of the lower fragment, combined with overlap and angulation are characteristic.

Treatment.—Early reduction is important in healthy, muscular adults. After a few days' delay displacement and shortening increase, and the infiltration of the non-extensile fascial compartments of the leg adds to the obstacles to reduction. Transverse fractures are usually easy to reduce and control, but spiral fractures offer considerable difficulty. It is essential to remember that the correct alignment of the leg implies the preservation of the normal degree of outward bowing. A common error is to "set" the fracture in a straight line.

Fractures with little displacement may be treated by fixation in plaster of Paris, and early weight-bearing allowed on a stirrup. Where there is overlap or other deformity, traction is essential on a Thomas splint with the knee in flexion. If considerable force is required, or if the condition of the skin is doubtful, skeletal traction by means of a pin through the os calcis must be employed. Sound union of the fracture is rarely obtained before the eighth to the tenth week, and is encouraged by weight-bearing in an ambulatory plaster.

Operative reduction in spiral fractures at the lower third of the leg is occasionally necessary if strong traction fails to restore accurate alignment. The wider use of skeletal traction has materially diminished the number of fractures requiring internal fixation.

In compound fractures immediate and judicious excision of all damaged tissue must be carried out; extension is usually necessary, and is best obtained by continuous traction on a traction pin through the os calcis. At the end of five to seven weeks extension, weight-bearing in a well-fitting cast, and passive

of Paris cast can be allowed.

LOWER END OF TIBIA AND FIBULA

The great majority of these injuries are produced by indirect violence represented by a forced movement of the foot on the leg—external rotation 61 per cent, abduction 21 per cent., or adduction 13 per cent.

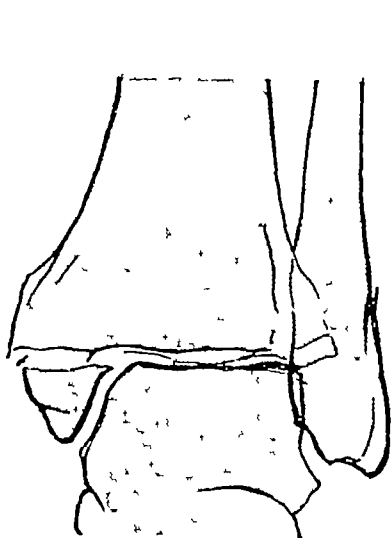


FIG 4.—External rotation fracture. Antero-posterior view. Note the separation of the internal malleolus. The fibular fracture is scarcely visible.

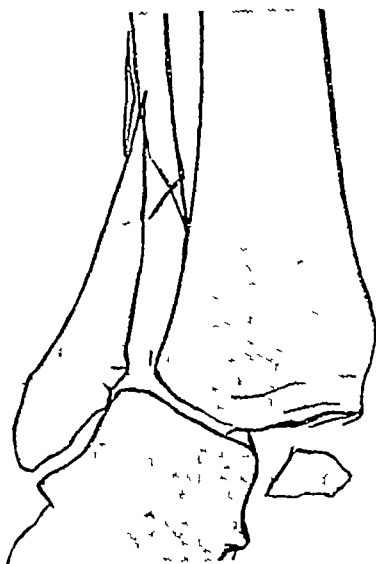


FIG 5.—Abduction fracture. The fibular fracture of the "bending" type is unusually high. There is an accompanying diastasis.

(Figs 4 and 5). The resulting fractures fall into three groups (1) Isolated fractures of the external malleolus; (2) isolated fractures of the internal malleolus; (3) the most important group of all, fractures of both bones, which form some 50 per cent of ankle fractures as a whole. The latter group comprises the classical Pott's, or more correctly the Pott-Dupuytren fracture, in which there is a disturbance of the mechanics of the ankle joint (Figs 4 and 5). In these the fibular fracture is the pivotal injury, and is combined either with a fracture of the internal malleolus or rupture of the internal lateral ligament. In 20 per cent of Pott-

Dupuytren fractures a third fracture is present—the posterior marginal fracture of the tibia produced by an upward compression thrust of the astragalus (Fig. 6).

The isolated fractures of the malleoli rarely show any appreciable clinical displacement, and the same is true of a considerable proportion of fractures of the Pott-Dupuytren type. Gross displacement is seen in some 25 per cent. of all ankle joint fractures. The characteristic deformity is eversion, with or without backward displacement of the foot. The latter deformity occurs

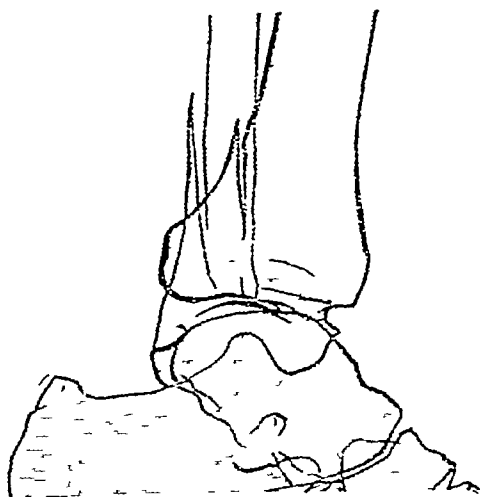


FIG 6.—External rotation fracture. Lateral radiogram showing the oblique fracture of the fibula and a posterior marginal fracture of the tibia.

where there is a posterior marginal fracture, or a separation of the two bones at the inferior tibio-fibular articulation.

Treatment.—(1) *Recent fractures* Reduction of the displacement should be carried out without waiting for the swelling to subside. After flexing the knee the heel is pulled forwards and the foot inverted. Pressure is then made on the malleoli to overcome any widening of the ankle mortise. In the classical fracture with considerable displacement reduction is effected a short time of the accident, the bones often set in situ.

position, and there is little tendency to recurrence of deformity. There is only one effective method of controlling an ankle fracture, and this is an accurately-fitting plaster of Paris cast. The cast should be removed at the end of three weeks, and an ambulatory plaster with a stirrup attached, or of the Delbet type, should be applied. Weight-bearing with the fracture carefully controlled in this fashion should be permitted from the third to the sixth week, according to the degree of the original displacement. After removal of the plaster a zinc-gelatine bandage, extending from the knee to the toes, is worn for two to four months in order to check the oedema which is commonly a troublesome sequel. In addition, the heel of the shoe is elevated on the inner side, and in heavy individuals an outside steel and T-strap give support and comfort.

In isolated fractures of the malleoli and combined fractures without displacement, the patient may be allowed to bear weight in an ambulatory plaster after a few days.

(2) *Old fractures* Malunion with deformity is not uncommonly seen in fractures of the Pott-Dupuytren type owing to ineffective reduction or omission to guard the fracture during the early stages of weight-bearing. In patients of suitable age and physique, operative correction of the malunion should be undertaken. In a deformity of a few weeks' standing, the line of fracture should be cut through and the displacement corrected. In a long-standing deformity the choice lies between a reconstruction of the fracture and arthrodesis of the ankle joint.

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¹ Jones, Robert, and Smith, Alwyn *Brit Journ Surgery*, 1913, **i**, 70

² Platt, H *Journ Bone and Joint Surgery*, 1928, **xx**, 403

³ Watson Jones *Journ Bone and Joint Surgery*, 1931, **xiii**, 258

Injuries of the Foot

By WALTER MERCER, M.B., F.R.C.S.E.

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IT is not only true that fractures of the bones of the foot are the most frequent of all fractures, but it is also, unfortunately, true that they are the most commonly undiagnosed. The Industrial Commission of Ohio reported in 1926 that out of a total of 4,473 fractures, no fewer than 1,349 affected the foot bones, i.e. more than 25 per cent of the total. Bacon, in reviewing the economic aspect of 3,473 fractures of all kinds, stated that, as regards total expense due to loss of time, fractures of the metatarsals, metacarpals, and phalanges of both extremities are more serious than all other fractures combined.

Unfortunately, it is little realized how easily the foot bones may be fractured. The 5th metatarsal may be broken by a mere lurch of the foot while dancing, or by operating the kick-start of a motor cycle. The calcaneus and talus are commonly injured by falls from a height; the height need not be great, the important factor rather appearing to be the alighting on the foot with the leg rigidly extended. Forcible and extreme movements cause sprain fractures, while direct violence, as when a heavy weight falls on the foot, is most likely to affect the metatarsals. The calcaneus, however, may suffer from the same type of violence, as in the "inching" fractures, where the wheel of a motor car, quick off the mark when the green light shows, shears off the posterior part of this bone in a slow moving pedestrian.

The failure to recognize such fractures may be due to (1) The considerable swelling that accompanies not only fractures, but also severe sprains and strains,

and which renders palpation of the bones difficult. (2) The absence of superficial bony points that might help in the diagnosis (3) The frequency with which the patient is able to bear at least some weight on the affected member. (4) Perhaps to some extent the fact that students are taught that foot fractures are easily recognized.

A high degree of disability frequently results from foot fractures, and this is not difficult to understand when the anatomy of the foot is considered. The dove-tailed fitting of the small bones, their close ligamentous connections, and the series of arches which are formed in the foot, all constitute difficulties which must be overcome in accurate reduction of fractures.

In view of the difficulty in recognition and of the severe disability that may result, it is superfluous to suggest that every foot injury, however trivial it may seem, should be X-rayed at the earliest possible moment. If no bone lesion is found, no harm has been done, but if a fracture is discovered, a lifetime of misery and crippling pain may be avoided by the early institution of treatment.

Many of these foot fractures are exceedingly difficult to reduce by manipulative methods, and it will be found better to enlist the services of a skilled operating orthopædist in the majority of cases, if a serviceable foot is to be the outcome.

Diagnosis—It is of the utmost importance that a diagnosis be reached at once, and, despite the fact that the bones are superficial, this is never easy. Stern has called attention to three important points—

(1) Sharp localized pain over the bone, easily demonstrated by palpating the bone with the rubber end of a lead pencil, and hence called "pencil tenderness."

(2) Local swelling, confined more or less to the area of tenderness.

(3) Local discoloration, from hæmorrhage in the

same area.

These signs appear in the above order, the third being late; indeed, the diagnosis should be made before it appears

The importance of X-raying the part in various planes cannot be over-estimated. The radiograms, of course, should be taken and interpreted by an expert, and even he should have at hand corresponding films of the normal foot for comparison.

FRACTURE OF THE TALUS

Fracture of the talus alone is rare, but it occurs not infrequently in association with fracture of the



FIG 1—A lateral view of the fracture-dislocation of the talus

calcaneus, of the fibula, or with a dislocation of the ankle joint. The lesion in the talus is usually a crush fracture, it may be produced, along with its associated injuries, by forcible dorsiflexion of the foot or by a fall. The fracture may be said to involve either the neck, the body, or the posterior process. The latter, however, may be dismissed in a word, since in most cases it is not a fracture but a non-union of the secondary centre for the posterior process—the so-called os

trigonum tarsi When there is a definite fracture, the treatment is simple, consisting of rest in bed for 10 days, with massage and early active movements

Fractures of the body are usually comminuted and compressed, but marked displacement is rare. The neck of the talus is weakened by the presence of many nutrient foraminæ and is susceptible, therefore, to mild degrees of violence. Fractures are produced by a fall while the foot is in a dorsiflexed position, the neck being nipped between the anterior edge of the tibia and the calcaneus. If the violence is excessive, the body of the talus may be expressed backwards, and, en route, may splinter the posterior aspect of the tibia. In its further progress, it impinges on the tendo Achillis and is rotated medially and vertically, so that the trochlear surface faces inwards and the fractured surface downwards.

Symptoms—In the absence of displacement, the symptoms of fracture are swelling about the ankle joint, tenderness in the region of the fracture, pain on weight-bearing, and on flexion of the foot. When the body is compressed, there is some loss of contour of the ankle, marked limitation of movement, and the malleolar tips appear to be at an abnormally low level.

The chief immediate symptoms are thus similar to a Pott's fracture, but the deformity differs in that there is an irregular filling up of the hollows on either side of the tendo Achillis. This may be more accentuated on one side or the other, and the tenderness is over the talus and not the malleoli. Crepitus is usually absent. The foot is held in the plantar flexed position, and on an attempt to relax the tendo Achillis, but there appears a tendency to either valgus or varus deformity. The injury may easily be rendered a compound fracture by pressure-necrosis of the skin overlying the fracture. The outlook then immediately becomes grave. The injury is very commonly overlooked,

even when good X-rays are available, but a consideration of the mechanism of the injury and the clinical findings should rouse suspicions of such a lesion. Where displacement exists, the injury is a serious one, and permanent disability is apt to result, especially if the error is not reduced early.

Treatment.—If there is no displacement, a plaster of Paris case is applied from the toes to just below the knee, with the foot at right angles to the leg and slightly inverted. After two weeks the case may be bivalved and massage and active movements instituted, but weight-bearing should be prohibited for six weeks and only allowed then if the arches of the foot are properly supported. Sponge-rubber arch supports are best, they are inserted into the boot, and are worn for three to six months.

The consensus of opinion concerning fracture-dislocations of the talus is that while it may be possible to reduce the error if it is recognized within a day or two of its occurrence, in late cases the best treatment is to remove the displaced fragment.

Under a general anæsthetic, traction is put on the foot with the ankle joint and the knee flexed to right angles to relax the tendo Achillis and open up the space between the tibia and calcaneus for the reception of the displaced fragment. This may be manipulated back into its normal site by finger and thumb, and, if it proves stubborn, further flexion of the foot will enlarge the available "socket." Should this manœuvre not be successful—and it becomes increasingly difficult with every hour of delay—further attempts should be postponed until the skin of the foot and of the leg is in a suitable condition for operation.

To achieve replacement of the fragment, it seems hitherto to have been considered necessary to carry out a tenotomy of the tendo Achillis. The present writer considers, however, that the necessary relaxation can be adequately secured by flexion of the knee.

If this position does not permit of replacement, then open reduction should be attempted

A lateral J-shaped incision, passing down the back of the fibula and turning forwards below the lateral malleolus, gives a good access to the fragment and avoids any operative trauma to the important structures on the medial side of the Achilles tendon. If reduction is unsuccessful, then the fragment should be excised. There appears to be no necessity to remove the head and neck of the talus, as their retention does not produce any foot deformity.

After removal of the fragment, a few days of absolute immobility are essential; massage and active and passive movements are then instituted. During the convalescence a lateral iron and a medial T-strap are important adjuncts to the treatment as they prevent any tendency there may be towards a lateral deformity.

FRACTURE OF THE CALCANEUS

Fractures of the calcaneus are the most frequent of the tarsal fractures, and where—as is usual—they are associated with displacement, poor functional results are the rule. As there is a consequent marked decrease in the earning capacity of the individual, these fractures are of distinct economic importance.

An avulsion fracture of the posterior portion and a fracture of the sustentaculum tali from forced inversion of the foot are comparatively rare. The avulsion type frequently requires open operation to secure replacement of the fragment, but thereafter the treatment is straightforward and the outlook good.

When the sustentaculum tali is fractured, there is frequently an associated injury of the spring ligament of the foot, so that, in the after-treatment, the greatest care is necessary to prevent a flat foot. Under anæsthesia the arch of the foot is carefully moulded into shape and, with the foot inverted and at right angles to the leg, a plaster cast is applied to support, in

particular, the long arch. The plaster is bivalved in two weeks and massage commenced, but weight-bearing is not permitted for six weeks. Thereafter the arch is supported for some months.

Fracture of the body of the calcaneus—A fall from a height, by driving the wedge-shaped inferior surface of the talus into the body of the calcaneus, may fracture the latter in a longitudinal or a transverse direction. Comminution and compression usually result, so that the bone widens, often to twice its normal width. There are frequently other displacements in the vertical and horizontal planes. Since

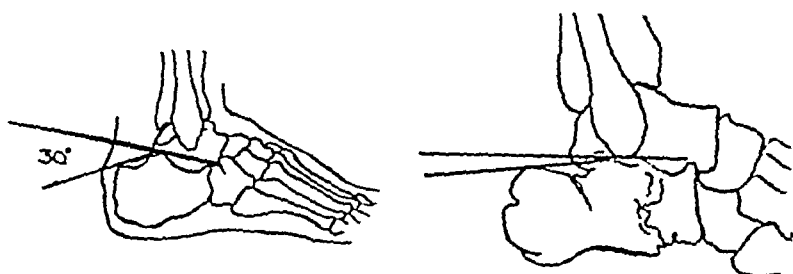


FIG 2—(a) Normal radiogram of the calcaneus, showing the angulation between the line joining the posterior process and the highest point of the articular surface and the line joining the latter point to the anterior articular surface. This is normally 30°

(b) Shows the effect of a crushing fracture, where the angulation is almost obliterated

the body weight is normally transmitted through the medial side of the bone, the inferior and lateral portion is usually displaced upwards and outwards, thus producing an excess of bony tissue under the external malleolus

Symptoms.—There is marked swelling about the ankle, particularly in the region of the malleoli and behind the mid-tarsal region. Flexion and extension of the foot are remarkably free, but lateral mobility may be completely abolished or, at least, greatly limited, and accompanied by pain. Crepitus is often present. Viewed from behind there is a characteristic broadening of the heel below the malleoli, and the

malleoli are seen to be on a lower plane than normally.

Diagnosis.—Although the patient is often able to bear some weight on the foot, a fracture must be suspected in the presence of localized pain and tenderness, broadening below the malleoli, and limitation of lateral movement. A radiogram will readily prove the presence of a fracture. In a lateral view of a normal foot the angle between the line extended through the upper articular surface of the bone and the upper surface of the tuberosity, and the line joining the anterior and posterior extremities of the articular surface is about 30° . After a compression-fracture this angle is considerably reduced or may be altogether absent, since the tuberosity may be higher than the articular surface.

Treatment.—Reduction of the displacement should be attempted under an anæsthetic. It is a difficult problem, however, and, as would be expected, many methods have been advocated. The chief deformities to be considered are the upward displacement of the posterior fragment and the broadening of the subtaloid portion from compression.

The upward displacement is maintained by the contraction of the calf muscles. At the onset, therefore, these muscles are relaxed by flexing the knee and by plantar flexing the foot. In this position an attempt is made to reduce the broadening of the body of the bone. Cotton advises pounding the heel with a sandbag, while Böhler uses a special *redresseur* which, by means of a screw, produces great lateral compression. Both methods inflict a considerable degree of trauma on the soft tissues, the one by the hammering, and the other by the slowness of the compression, which damages the blood supply.

The present writer employs the following method, which he believes is an improvement on the two above described: Under a general anæsthetic the foot and leg are prepared as for an open operation. The knee

is flexed over the end of the operating table, which is elevated to its full height. A fairly strong metal pin is then inserted through the posterior fragment, and to its projecting ends a loop of rope is attached. To reduce the upward displacement of the posterior fragment, strong traction is exerted by means of the operator's foot inserted through the loop. A special



FIG 3 —The method of reduction of a fracture of the calcaneus

instrument, which is fashioned on the lines of the osteoclast but with special rubber-covered wooden pads, which in the normal foot would fit into the depression below the malleoli, is then employed. The wooden pads are applied, one on each side of the heel, opposite the widened bone, and the handles firmly brought together. The advantage of this instrument is that, while the long handles permit of any degree of compression necessary, that compression is momentary, and therefore less devitalizing to the soft tissues than the screw.

When the normal contour has been restored by this means, and the displaced posterior fragment replaced by traction, a plaster of Paris case is applied over sterile dressings to the leg from the foot up to the mid-thigh, with the knee flexed to a right angle and the foot just plantar flexed. The pin is incorporated in the plaster and left in position until the plaster is removed in about four weeks' time.

A lateral X-ray is taken immediately after reduction, but it is usually possible to be reasonably certain of success at the time of manipulation if the broadening has been obliterated and full traction applied to the pin. A certain degree of adduction of the foot can be secured before the application of the plaster by exerting a slightly greater pull on the outer part of the extension pin.

On the removal of the plaster in four weeks, the pin is extracted and a sterile dressing is applied to the resultant wounds. An elastoplast bandage is then applied from the toes to below the knee, to dissipate or prevent cedema. Active movements are encouraged, and the patient is allowed about on crutches. No weight-bearing is permitted for ten weeks, and then only if the patient can wear shoes. These are built to produce a little deviation, usually inwards, i.e. in adduction, although it will occasionally be found that the patient is more comfortable with an outer raising to the heel, producing abduction. Several adjustments should be tried, and the one which suits the patient best retained. An inserted instep support of sponge rubber is also fitted to the shoe.

Treatment of mal-union—Unfortunately, many of these fractures resist manipulative reduction, and many more are unrecognized, both by the patient and by the doctor, and so it is common to see in consultation old **unreduced** fractures with broadening of the end, limitation of movement, flat foot, and great pain **weight-bearing**. Such severe disabling effects can

only be alleviated by operative means, since tilted heels, arch supports, and other conservative measures rarely produce benefit

The exact details of the necessary operation vary to some extent with the type of displacement, but in general the principal step of the operation is a subtaloid arthrodesis. The adjacent surfaces of the calcaneus and talus are removed, along with their interosseous ligaments, and it is usually necessary to make the upper surface of the calcaneus slope upwards and backwards to correct as far as possible the upward displacement of the posterior portion. Bony masses impinging on the external malleolus should be removed and, if the radiogram shows calcaneal spurs, these also should be excised.

The post-operative treatment is that of a fracture. The foot is put up in a plaster cast for five weeks, after which elastoplast bandages, massage, and suitable foot wear are employed.

NAVICULAR AND OTHER TARSAL FRACTURES

Fractures of the remaining tarsal bones are rare, and consequently of less importance than those of the calcaneus and talus, although they too may result in long standing disability. The navicular may be fractured by direct violence, and the lesion is often associated with fractures of the other bones of the foot. A fracture may result from a fall on the foot, the bone being crushed between the talus and the internal cuneiform. The insertion of the tibialis posterior into the navicular explains those avulsion fractures in which the tubercle is torn off. Usually there is some displacement of the fragments, and some localized pain and tenderness, the former being increased on attempted weight-bearing. Local swelling and ecchymosis is evident and the foot is held in an abducted position. In viewing the radiogram, the sesamoid bone occasionally present in the tibialis posterior should not

mislead one into assuming the presence of a fracture

Treatment.—When there is no marked displacement, a plaster cast should be applied to the inverted and adducted foot for four or five weeks. Weight-bearing should be prohibited for five to ten weeks and thereafter a properly adjusted shoe should be worn. The presence of a complicating displacement demands open operation, with reduction, or partial excision of the fragments and arthrodesis followed by plaster immobilization.

Occasionally chip fractures of the cuboid or internal cuneiform are found, often long after the original injury. These are often accompanied by severe injury to the soft structures and result in flattening of the arch of the foot. They are usually notable for the amount of oedema which results, and in its presence a guarded prognosis should be given, as frequently, although little is to be seen in the X-ray, it may be many months before the patient is able to resume his work. The main feature of the treatment is to immobilize the foot for two or three weeks in a position in which there is least tension on the important plantar ligament—i.e. in adduction and inversion.

FRACTURES OF THE METATARSALS AND PHALANGES

Fracture of one or more of the metatarsal bones is a fairly frequent injury. It may be the result of direct violence, as from falling objects, or less frequently from indirect violence, such as the sudden impact of the body weight on the toes, as in jumping or running, or even a misstep in dancing. There is usually considerable bruising of the overlying soft parts, with swelling, pain, tenderness on pressure, and ecchymosis. It is frequently possible to detect crepitus, and the fragments may be moved on palpation. Multiple fractures are frequent.

Fractures of the fifth metatarsal are particularly common and are produced by direct pressure on the

outer part of the foot in the position of inversion. Fractures of the second metatarsal usually occur at the neck of the bone, frequently in soldiers, and hence called march fracture, this is of the nature of a pathological fracture. There is primarily a falling of the anterior arch, with a secondary spasm of interossei muscles which inhibits the blood supply to this bone. As, when the anterior arch has fallen, the second is the longest metatarsal and bears most weight in stepping

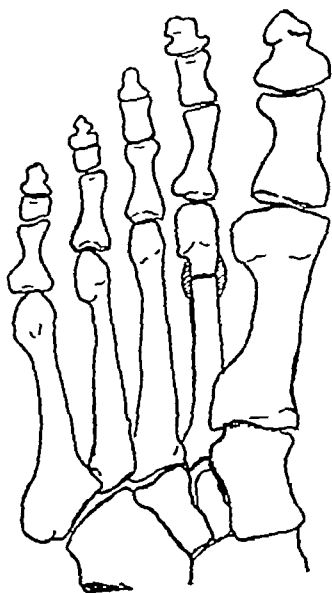


FIG 4 —Line drawing showing the appearance of a March fracture

forward, it may happen that the bone cracks at the neck even with the slight trauma of ordinary walking.

Treatment —In most cases where a single metatarsal is involved, there is little tendency to displacement. Many such cases, therefore, require no further treatment than a plaster of Paris case from the toes to just below the knee joint. The foot should be slightly inverted, at a right angle to the leg, and with the arches of the foot amply supported. In ten days' time the case may be removed and massage and active movements of the various joints started. Union should be

Sports Injuries and their Treatment

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A MAN or woman who can enjoy a strenuous day's sport—hunting, for instance—relies upon six principal factors (1) the integrity of his framework, e g bones and ligaments; (2) the potency of his power unit, e g both the tone and the contractile power of his muscles, (3) the adequacy of his lubrication system, e g synovial membranes and bursæ, (4) the elasticity of his scavenging system, e g lymph channels and glands and skin. In addition to these four main systems he depends also on the efficiency of his co-ordinating supply services, e g blood and nerves, and to a lesser extent, for protection, on the condition of his skin.

When dealing with any injury of sport it is essential to realize the independence and interdependence of each of these systems. A breach of the framework—such as a fracture—may, and as a rule does, become the principal factor influencing treatment, but at the same time that the bone breaks the power unit of the part loses efficiency, the lubricating system tends to stagnate and the drainage system is seriously impaired. The main injury, on the other hand, may affect a muscle or its tendon while the framework escapes. A rider's strain, for example. An injury of this kind demands just as great attention to the other services. not only attention to any possible damage that they may have sustained at the time of the accident, but attention during the process of repair, so that treatment considers their needs, and the advance towards recovery is uniform at all points.

If the practitioner bears in mind the importance of

these main systems and of the patient's general health, and at the same time remembers the auxiliary systems, he will be able to diagnose more easily and treat more intelligently. Unfortunately there are some conditions, such as dislocation of the elbow and fracture of the scaphoid, where the welfare of all the systems cannot be pursued simultaneously and one must be sacrificed to another. A long period of immobilization involves considerable debility of the power unit and stagnation in the oiling and scavenging systems. These can generally be restored later, but allowance for their subsequent treatment must be made in the prognosis.

DIAGNOSIS

(1) *The framework*—The signs of loss of integrity in the bones and ligaments are classical—pain, loss of function, deformity, crepitus. Their recognition, together with the use of X-rays, requires no discussion. When the practitioner is doubtful whether or not he ought to have an X-ray, it is worth remembering that pain which is sudden, sharp, localized and brief always strongly suggests bony injury. Pain due to damage of other tissues tends to build up more slowly, to linger, and to radiate or shoot away from its point of origin.

(2) *The power unit*—Gross interference with the power unit—for instance, complete rupture of the biceps, quadriceps or adductor longus—is always so obvious as to present little or no difficulty in diagnosis. There is a gap in the muscle, a hæmatoma and loss of function. On the other hand, the diagnosis of strains that have probably torn a few fibres of muscle and tendon is not always easy. There are, however, certain helpful guides.—

(1) Muscle-fibre injury is suggested by (a) cramp-like pain localized over a muscle-belly, coming on rather slowly and passing slowly away; (b) a heaviness or tired pain increasing with voluntary movement or effort and also localized over a muscle-

belly.

(ii) Muscle-belly injury is suggested when the pain of voluntary movement is diminished by support or partial fixation of the suspected muscle group near its tendon. If this support increases the pain, the condition is probably either a tendon injury or tenosynovitis.

(iii) Injury to a tendon or its insertion is suggested when voluntary movement is painless over a limited range and then becomes painful and increases as the movement is completed

Disturbance of muscle tone can be detected by two rapid tests which have been used for years in the Royal Air Force, especially after minor crashes —

(a) The splashing stomach test The patient lies flat and relaxed and the examiner rocks the anterior abdominal wall with his hand. If there is a splashing like that produced by shaking a half-filled bottle, tone is certainly poor. If the splashing is heard at first but diminishes when the rocking is continued, tone is disturbed but not lost

(b) The jugular vein test. The patient again lies flat and relaxed and the examiner presses firmly down on the abdominal wall. If the external jugular veins immediately fill out and bulge, the vascular and muscular tone is certainly poor

(3) *The lubricating system* — There are some definite “snags” in the examination of this system.

Wash-leather creaking is the classical sign of tenosynovitis, but this condition may be present without creaking, and creaking may be heard when the lesion is a tendon injury or a bony fracture. A swelling near a joint may be due to effusion into the joint capsule or part of some bony injury near the joint. Here, again, there are some helpful guides —

(a) The patient with tenosynovitis or synovitis of a joint complains of a discomfort on palpation which is uniform in intensity over a limited area and then stops

suddenly at a line which corresponds closely with the anatomical surface-marking of the tendon sheath or joint. The pain of tendon or bone injury has a spot of maximum intensity but tails off gradually and irregularly and does not cease at any anatomical boundary.

(b) In tenosynovitis voluntary movement of the corresponding muscle causes an even increase of pain which is made worse if the movement is resisted and reduced if the painful area is supported in a light but firm grasp.

(c) Uncomplicated tenosynovitis usually comes on slowly, in the evening after a game, whereas tendon injury makes itself manifest almost at once.

(d) Bursitis is characterized by a pain near to but outside a joint. The patient at first has difficulty in demonstrating or reproducing his pain; it catches him unawares and suddenly inhibits muscular action, passing off with equal suddenness. The bursæ most often affected in sport are the sub-deltoid, biceps cubitus, gluteus medius and semi-membranosus bursæ; and they need especial care in diagnosis and treatment.

(4) *The scavenger system* —Gross defects in this system are easy to recognize. e.g. œdema, boggy, large and tender swollen glands. Minor defects are, however, not so easy to recognize, largely because little attention has been paid to the importance of this system. The drainage is not adequate if a part feels larger than it should do to the patient, and particularly if it "squeaks" or "creaks". A part inadequately drained also has a curious dead, chilly, toneless feeling.

TREATMENT

(1) *The framework* —Injuries to bones and ligaments are dealt with elsewhere in this issue, and it is sufficient to remember that:

(a) Repair takes place through the agency of imported primitive blood cells; therefore, the injured part must be kept well nourished with blood.

(b) Functional recovery is in direct proportion to anatomical reconstruction

(c) Mobilization and immobilization can both be overdone; excessive use handicaps repair to the framework, and prolonged disuse hinders the recovery of the power unit and the oiling and drainage systems and causes unequal functional recovery.

(2) *The power unit*—When a muscle has been injured, fibres are lacerated, blood and lymph are effused and the muscle is in spasm. True regenerative repair in a muscle is slight, and lacerated fibres are replaced by connective tissue. Effusion handicaps nutrition and—unless it is rapidly absorbed—pre-disposes the part to excessive fibrous tissue formation. Spasm tends to increase the damage to fibres. Tendon regenerates much better than muscle but is easily overstretched during the process, thus requiring increased tone in the muscle to take up the slack.

The treatment of sports injuries falls into two or three stages. During the first stage the principal requirement is rest—support or fixation—so that the origin and insertion are approximated. The area can be brought rapidly to the second stage by Mennell's gluco-kinesis—a form of sedative massage amounting to local hypnosis of the parts—and small doses of direct current¹. If these special physical measures are not available, pain and spasm are relieved by glycerine and belladonna liniment applied on lint for 24–48 hours. Aspirin is helpful but should be given in powder form or the tablet should be sucked slowly.

The value of massage, passive movements, resisted movements and active re-educative movements in the later stages is known to all, but too little use is made of the Smart-Bristow (or "Bristow") coil and the many interesting and valuable ways in which this apparatus can be used to re-condition injured and debilitated muscles. The apparatus is portable, reliable, simple and self-contained, works from dry cells and gives a

comfortable contraction. To get full value from it, treatment should be continued until the injured limb is at least equal to the uninjured one in circumference, and preferably until it is larger.

The achievement of good tone, condition and functional ability in the power unit is the keystone of the treatment of injuries of sport, and its importance cannot be exaggerated. Tone is the secret of sport. Formal exercises are often boring, but fencing, which can be carried out by artificial light after working hours, is an excellent exercise for the restoration of tone and will hold the patient's interest.

(3) *The lubricating system.*—Synovial membranes and bursæ are the anti-friction devices of the body; they are therefore naturally subject to minor injuries in all kinds of sport. There is no one specific treatment of synovitis, whether it be in a joint or in a tendon sheath. Each patient is a separate problem and his basic physical condition is the factor determining the choice between modified rest, support and movement. It is a good general rule never to give any but a guarded prognosis until the individual patient's response to treatment is manifest, as age, condition and inter-current ailments play so large a part in recovery.

The use of electrical currents and massage requires care and special technique if the condition is not to be made rapidly worse. There seems to be no doubt that variations in temperature are helpful. Some patients benefit from hot salt baths, others from cold evaporating lotions, others from an even temperature maintained by bandaging over cotton wool. The recently introduced "elastoplast"—a modified form of Unna's paste on an elastic bandage—is valuable in supporting parts where there is synovial effusion; it seems to provide a reasonable amount of support and rest without constriction and without preventing the small movements that are essential to recovery. It is less irritating than zinc adhesive strapping but does not give

the same firm support

Traumatic bursitis is difficult to treat. Only one of the many methods I have tried has yielded a high percentage of successful results. This is a succession of erythema doses with the Kromayer lamp, every three to five days, to small areas of skin over the bursa. No other source of ultra-violet light gives such a good result. The treatment is almost specific for sub-deltoid bursitis provided there is no calcification.

(4) *The scavenger system*—The lymphatic system acts as a whole, and toxic absorption in any part affects the drainage in any other part. The eradication of toxic foci is only important, however, in injuries of sport when the patient's capacity to deal with toxins is greatly lowered or the toxins are excessive in amount or virulence. The average healthy individual's reserve should be ample to deal with minor injuries and small toxic foci. Lymph flow is aided, directly or indirectly, by massage and many other physical methods. A simple and valuable technique is for the masseuse to wear a pair of rubber gloves and over these a pair of cotton gloves connected with a Bristow coil by means of a flexible electrode on the back of each hand. The gloves are soaked in warm soap solution and the hands can be used as electrodes while they carry out the movements of massage.

Spa treatment, with douches, massage, regular hours, ordered meals, rest and freedom from worry, is particularly valuable and should never be forgotten after any serious injury in sport. The importance of the auxiliary services of nutrition and nerve supply is obvious, on them everything ultimately depends, and they must never be forgotten by the practitioner.

Reference

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Chemotherapy in Cancer

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THE term "Chemotherapy" is somewhat difficult to define. I have attempted to do so in the following words: "Chemotherapy denotes treatment by synthetic preparations which have a selective therapeutical action on abnormal tissues of the body and on the organisms that may infect it, with or without the production of associated constitutional phenomena"¹ Strictly speaking, therefore, biological methods of immunization are not included. It was, however, on the lines of such immunization that I worked twenty-five years ago², and Lumsden⁴ is now trying to solve the problem

In these days we live in an atmosphere of preventive medicine, and although this has found its most dramatic performances in the prevention of bacterial and parasitic diseases, I for one never fail to urge that by prevention alone can we expect to reduce appreciably the terrible toll malignant disease is taking of human life Yet this prevention may be chemotherapeutical in nature

There is a considerable difference of opinion as to whether cancer should be considered a local disease, or regarded as a constitutional one Obviously, from the point of view of the chemotherapeutist, this is of no real moment It is, however, a matter of great importance to those who believe only in local forms

of treatment. The two chief types of local treatment are surgery and radiations—X-rays and radium emanations. Both of these methods have cured many cases of malignant disease, and it is, therefore, difficult to obtain a confession that local treatment is not a scientific method of attack, and that chemotherapy is

Yet to those who practise local treatment only it must always be an anxious reflection that an apparent local "cure" by no means implies that the patient is safe from the perils of dissemination of the disease throughout the body, perhaps many years later. Moreover, I have seen cases of cancer of the cervix, apparently cured with radium, in whom there has subsequently been widespread dissemination in the peritoneal cavity and elsewhere. I have never seen this happen with untreated cancer of the cervix. So, too, an incomplete operation for malignant disease may lead directly to stimulation and spread of the growth.

After all, what are the triumphs of surgery and radium? Only those attaching to any form of destruction or removal of the well-known forms of the disease that for long remain localized. I could write a good deal about radium and the outlook regarding its value; but I am philosophically fascinated by the physical activities of this substance and have no wish to decry so beautiful a weapon, however imperfect. Besides, millions are being expended on radium, and money speaks.

Nevertheless, we must remember that of all the patients who die of malignant disease at least three-quarters of the number could never have been considered really suitable for local forms of treatment, by the time it was possible for anyone to discover the existence of the disease. So, I think, there is a case for chemotherapy, in spite of the fact that most investigators are at present absorbed in finding an extended

use for local methods

The time will soon come when the pendulum will swing in the other direction. Yet surely even then we shall still combine local with chemotherapeutical measures in many cases. This is a practice of which I have never lost sight and employ whenever possible

DIFFICULTIES OF CHEMOTHERAPEUSIS

When we have to deal with bacterial and parasitic diseases the problem of chemotherapeusis is not very difficult. We must seek for a selective poison for a foreign organism that has obtained access to the host. Its tissues, and also their functions, no doubt differ much from those wherein the organism has lodged. In malignant disease, on the other hand, the abnormal cells belong to the host and grow in a fundamentally similar manner to those of the normal tissues; and there are functional differences between the several types of neoplasm, according to their ontogenetic origin—differences which are similar to the functional variations of the many types of normal tissues from which the neoplasms have sprung.

It appears, then, that in our ideal chemotherapeutical material we may have a basal factor which arrests all growth—normal and abnormal—and some added factor which will interfere with the metabolism of the special cell-type; consequently, it may well be that in the end we shall have different preparations all containing, however, the essential anti-growth factor. Meanwhile special study has been directed by us to normal physiological malignancy as seen in the chorionic epithelium; and, in the absence of final knowledge concerning the nature of the inhibitory factor controlling the invasive properties of this tissue, and the isolation of it, we have turned to a poison, namely, lead, that appears to exert an almost specific destructive effect on the chorionic epithelium.

Another difficulty in the way of effective chemo-

therapeusis is the avascularity of many forms of cancer, and the fibrosis which may occur around the neoplastic cells, rendering them secure from the action of poisons circulating in the blood-stream.

In the final outcome of this form of treatment it appears likely that we shall come, indeed we are now coming, to the belief, that it is better slowly to damage—devitalize—the malignant cells and to leave them a prey to the eliminative activities of the predatory cells of the body. This seems better than attempting the rapid necrosis at which we originally aimed

THE ACTION OF LEAD

The action of lead in inhibiting growth is well known. Many times we have described the effect of this metal on growing seeds and roots, and on animal development,² it has an almost unique effect of stunting—slowing growth—as well as arresting it entirely. This seems to depend on the dosage.

Again, we have shown how lead will cause coagulation necrosis in the chorionic epithelium of the rabbit without affecting the mother. This epithelium is particularly vulnerable not only because of its malignant and rapidly-growing propensities, but also because of its extreme vascularity. So, too, rapidly-growing cells which have reverted to malignancy appear to be plumbo-sensitive just as they are radio-sensitive, but it would seem that whereas radiations are physical, like heat, in their action, lead must act chemically. This action of lead has, however, never been satisfactorily demonstrated, in spite of all the chemical research conducted by ourselves and others. There are some who think the action of lead is constitutional, some who regard it as entirely local, and others, of whom I am one, who think it may act in both directions.

The different findings that have been recorded in regard to the lead content of treated neoplasms, must be correlated with the result of that treatment and the

accessibility—that is, the vascularity—of the growth. We do not disguise from ourselves the necessity of further controlled work on this question, for it can so readily be shown that in the case of stunting in vegetable growth lead is deposited both in the cell-walls and in and around the nuclei of the growing root-tips² I cannot help believing that our original suggestion may prove to be not far wrong. namely, that the high phosphatide content of rapidly growing tissues is in some way affected by lead

LEAD IN THE TREATMENT OF MALIGNANT DISEASE

Whether malignant disease be local or constitutional in origin—in my opinion it is local—there can be no doubt that profound constitutional disturbances soon become evident. No specific metabolic change to account for this has yet been conclusively demonstrated.

Many years ago Rosenheim and Shaw-Mackenzie⁵ showed that the normal augmentative effect of serum on lipase activity is reduced in malignant disease, and also in other pathological states. As, however, the other conditions—for example, scarlet fever—can usually be readily recognized, it was thought that this co-enzymic reaction might be employed in the diagnosis of cancer. It is impossible to discuss this question at length here, but it may be mentioned that in cases under treatment with lead, and after effective operation, when the patient is doing well, the reaction returns to or towards the normal. We have, therefore, in this reaction a method of checking the effect of treatment.

Treatment with lead, especially with unsatisfactory preparations, may be very dangerous, and obviously the more so when employed by those unaccustomed to its use, and without proper laboratory facilities for making the necessary investigations of the hæmatological, hepatic and renal states. With experience we have reduced the danger practically to vanishing

point, and with it even discomfort to our patients. Still we have remained dissatisfied, for there is no doubt that in the early days those who suffered most, especially from small quantities of lead, often did best. It is clear, of course, that what we want is a material containing lead in a non-toxic form—that is to say, a colloid, a complex or a compound of lead from which the metal is but slowly dissociated, and, if possible, becomes fixed only in, or in the neighbourhood of, the growth, the excess being excreted unchanged. The chemotherapeutic index must be high.

Professor Lewis and Dr. Jowett have, I think, brought the preparation of colloidal lead itself to a high degree of perfection, and this product we still use; but we are not convinced that it is impossible to secure anything better. Professor Heilbron and Dr. Beilensohn are preparing for us many organic compounds which are being carefully tested pharmacologically and experimentally on animals with cancers, and about these I should like to say a few words.

In the first place, although we may succeed in curing animals with malignant disease by chemotherapeutical methods, it does not necessarily follow that the material which has been successful in them will be equally innocuous and useful in the case of the human subject, of this I will give an example directly. Yet, to-day, largely because certain scientific investigators see nothing of disease in man, they have laid down what in the final result amounts to the inflexible rule that what applies to animals applies to men. This is stretching the advantages of experimental pathology to breaking-point. To be provocative one may almost express the opinion that the chemotherapeutical product which will cure cancer in animals may be ineffectual in, or poisonous to, the human subject, but that which will cure cancer in man will almost certainly act in the same way with animals.

During the last fourteen months, owing to the

kindness of Professor W P Graves and Dr. Smith, of Boston, we have had in my laboratory the Brown-Pearce transplantable epitheliomatous neoplasm of the rabbit. This is a rapidly-metastasizing growth; every organ in the body being quickly involved. Untreated it is inevitably fatal, after the transplant has definitely taken. Approximately 80 per cent. "takes" can be secured. My colleague, Dr. Datnow, has now transplanted the growth about two hundred times. The best sites for transplantation are the ovaries and testes.

One animal with extensive metastatic tumours died in 22 days. The average duration of life without treatment is about 12 weeks.

An organic preparation, H_{128} -benzenesulphonyl-glycinate—prepared in Professor Heilbron's laboratory, gave most dramatic results when injected intravenously into animals with widespread metastases. An animal in which there were numerous metastases, and one in the left eye entirely recovered, although blind in the affected eye, and is alive now, 12 months later. Our successes in this direction are about 25 per cent. of animals treated. We hope soon to publish a paper on our experiences with this neoplasm.

Very effective as is this preparation (H_{128}) in the case of the rabbit, we have found it impossible to use it on human patients owing to its great toxicity in them when injected intravenously. Rabbits are not very susceptible to lead. Moreover, it cannot be injected hypodermically or intramuscularly, for it is irritant. This has been a great disappointment to us.

However, a few weeks ago we had a visit from Dr. W. A. Collier of the Koch Institute, Berlin. We already knew of the successful work, based on our researches, which he had done in conjunction with Professor Krause in the treatment of mouse carcinoma with tri-normal-propyl-fluoride and other compounds.

of lead, and published two years ago

Dr Collier assured us that there they have now become convinced, after extensive experimentation, that in lead we have the only known element that specifically affects cancer, apart, of course, from the local effects of radiations. He told us that they also were using the same material—namely, the Brown-Pearce rabbit-tumour—and had found it as satisfactory as we are finding it in respect of certainty of positive implantation and fatal outcome

Dr. Collier then went on to say that his chemical colleague, Dr Rothmann, had prepared a water-soluble, diffusible, organic compound in which the lead is not ionized, and which remains unaltered, as they had proved chemically, in the tissues when injected locally—a difficult thing to understand—and is slowly taken up in this state, without any toxic, but with a curative, effect on the malignant neoplasm of rabbits in 80 per cent of all cases. Moreover, we were given to understand that the excess is excreted unchanged *

The German preparation is somewhat similar chemically to one prepared in Professor Heilbron's laboratory, which we rejected on pharmacological examination, and for which such claims as the above cannot be made. Evidently changes in the structural formula have brought about great differences in its properties

Dr Collier has only just commenced to treat human cases, but he informed us that no toxic symptoms have been seen, and that they are satisfied with the results

I know well that Dr Collier's work is incomplete and that nothing in the way of finality may come of it

* Since this was written Dr Collier has kindly sent us some of this preparation—a hygroscopic powder. So far as our examination of it has gone, we have confirmed all the statements made concerning its properties, except the facts that it is unaltered in the tissues, that it is excreted unchanged in the urine, and has high cancer-curative properties, but we have not completed our investigations in regard to these three important points

in connection with human cancer. Still it is interesting to realize that in Germany, France, and the United States of America they think it worth while to persevere in a field of chemotherapy held by many in this country to be unworthy of more than crude clinical investigation. The same attitude, based, I am told, on the views obtaining here, was held at first at the Koch Institute, but I understand that this has been entirely changed by the results already obtained.

Fournier³ at the French Congress of Medicine last year made the following statement:

He has for several years used injections of fumarate of lead in cases of cancer in which the tumour was inoperable or not accessible to X-ray or radium treatment. He has never observed injurious effects. On the other hand, he has had very encouraging results. All the patients have been relieved, many have been cured and their cure has been maintained for more than two years without recurrence.

I do not know whether these observations with lead fumarate have yet been confirmed by others or not.

In such a brief account as I have given of chemotherapy in cancer, it may be felt by some that I should have said more of the treatment of patients whom we have treated. In this respect I have at present little to add to what has already been published.² We have seen more than enough to realize that in many cases treatment with lead offers the only possibility of, and frequently secures, beneficial results. Moreover, we firmly believe that a course should always be given to patients after operations for malignant disease.

Finally, I must discuss the application of the word "cure" and the term "clinical cure" of malignant disease. With regard to the first, I suppose we can claim a cure of cancer provided every cancer cell throughout the body is destroyed, but how are we to be sure of this?

scribed the hæmorrhagic form of ulcerative colitis, suggested the possibility that the bacillus of dysentery was an etiologic factor, and pointed out that *Bacillus coli*, *Bacillus pyocyaneus* or the pyogenic cocci might act as secondary invaders in a lesion primarily formed by the dysentery bacilli

Hale-White, in 1911, stated that he had met with cases of primary ulcerative colitis due to the *Bacillus coli*, pneumococci and streptococci, and felt that injections of autogenous vaccines had caused some improvement

Bassler, in 1911 and 1913, pointed out that there was a definite group of colonic lesions due to *Bacillus coli communis* Lockhart-Mummery, in 1913, reported a case in which he believed *Staphylococcus aureus* was the etiologic agent Rosenheim, in 1908, proffered the idea of a change in colonic acidity and in the pathogenicity of the colon organisms as the cause of colitis Lynch and McFarland, in 1916, regarded the normal flora as a prime factor in the etiology of the disease, and Logan, in 1919, considered a number of organisms potentially responsible for chronic ulcerative colitis if the bodily resistance was found to be lowered sufficiently

In 1921 Hurst, and also Leusden, expressed the view that the condition was the result of a former infection by some form of dysentery bacillus, *Bacillus dysenteriae* disappearing from the stools, leaving the resulting lesions adumbrated by active secondary invaders Having first observed marked benefit from intravenous administration of serum in cases of acute bacillary dysentery while visiting in Salonica, Hurst^{26, 27} further substantiated his conception by giving patients suffering from chronic ulcerative colitis large doses of polyvalent antidysenteric serum, and reported good results At that time, he believed that the serum had specific action on the disease.

In recent years many workers have suggested the

beneficial results which accrue from the use of plain serum, and it is interesting to note that Hurst²⁸ realized that treatment with polyvalent antidysenteric serum "may be non-specific and nothing more than a form of protein shock." He stated further, in 1927, that attempts at isolating the organism of bacillary dysentery either from the stools or from swabs taken directly from ulcers through a sigmoidoscope had failed to reveal the dysentery organism. However, from Hurst's²⁹ discussion of the disease in 1931, one gets the impression that he believes anti-dysentery serum to have specific properties. He quoted the finding of *Bacillus dysenteriae* in nine cases of what was thought to be colitis, in the practice of seven physicians (Nabarro, 1912; Dudgeon, 1923; Hadfield, 1927, Thoralakson and Cadman, 1928, and Knott and Hurst, 1930) over a period of eighteen years as evidence favouring the etiologic relationship of the organism to chronic ulcerative colitis. Could not these sporadic observations be evidence of incidental invasion? Dukes dismissed the theory that the disease is due to *Bacillus dysenteriae* because of "almost universally negative bacteriological and epidemiological evidence, the absence of agglutination and the uncertain effect of antidysentery serum." Tidy has had no success with the use of anti-dysentery serum in the treatment of chronic ulcerative colitis. Sir Charles Gordon-Watson stated that he had tried anti-dysentery serum in a large number of cases but had never satisfied himself that there had been much benefit from it. He had a dramatic result in one case, but relapse occurred a year or two later, and the patient did not respond to anti-dysentery serum the second time. Crohn, in 1927, expressed the opinion that the serum acts entirely as any foreign protein would; he has been unable to isolate organisms of dysentery or to get convincing agglutinations in blood serum of known dysentery bacilli in cases of "non-specific ulcerative colitis."

Thorlakson, in 1924, advanced the view of those who held that chronic ulcerative colitis was due to the bacillus of dysentery, and in 1928 he⁴⁸ presented cultural evidence in favour of such a view. A specimen was taken from the base of an ulcer in five cases. He used a sharp-cutting curette, thus obtaining more material than simply a smear from the surface. He felt that this was the reason that Cadman had been able to isolate organisms of dysentery in four of the five cases investigated. A serum was prepared and used, he said, with gratifying results.

Garrod has examined the patients admitted to St Bartholomew's Hospital for the last two or three years and has made cultures from swabbings of the ulcers taken by sigmoidoscopy and has not found dysentery bacilli in any case. In eleven of seventeen cases in which examination was made for the diplo-streptococcus described by one of us, it was found, and Garrod regarded this organism of considerable significance.

One of us (Bargen),² in 1924, began a study on the etiology of chronic ulcerative colitis and, at the outset, attempted to isolate organisms resembling the dysentery bacillus, but without success. However, large numbers of Gram-positive diplococci were found in cultures taken from the bases of the ulcers with sterile swabs that were passed through a proctoscope after the bowel had been adequately prepared. It was suggested that this diplo-streptococcus, of definite morphological, cultural and biological characteristics, played an important part in the causation of certain cases of chronic ulcerative colitis. Later studies⁶ have done much to confirm this and to establish the organism as the important etiologic factor of this definite entity.^{18, 24, 44}

CLINICAL PHENOMENA

It is well, before going into the investigative work, to survey the outstanding features of the disease

They comprise usually a gradual onset with diarrhoea, rectal discharges of blood, pus and mucus, mixed with faeces of varying consistence, usually a mild, sometimes a severe, febrile course, and the passage of from ten to fifty stools and rectal discharges a day. The disease usually begins in the rectum or sigmoid, and, extending upward, may invade any sector of the colon, or often the entire large bowel.

The proctoscopic examination is of prime importance in the diagnosis of chronic ulcerative colitis. Buie and others have described the typical proctoscopic picture. The appearance of the mucosa of the rectum and sigmoid in the four phases of activity in the disease, namely, hyperaemia, oedema, milary abscesses, and milary ulcers, is not easily confused with that of any other known lesions of these structures. The stage of remission, too, carries its typical proctoscopic picture.

The roentgenoscopic and roentgenographic features of this disease are characteristic and often most helpful in determining the extent of the lesion and the degree of activity and involvement of the wall of the bowel. Occasionally, late in the disease, the lower part of the ileum is found to be involved.

After repeated exacerbations of the disease, the colon gradually becomes denuded of much, or most, of the mucosa, so that, at necropsy, it presents islets of mucosa, on which there are typical signs of the disease, on a dense base of granulation tissue, the wall of the bowel being very thick and non-elastic.

EXPERIMENTAL STUDY

Following the lead of Thorlakson,⁴⁸ in 1928, we selected consecutive cases of chronic ulcerative colitis, taking both the mild and acute cases for study. Data concerning these patients are given near the end of this paper. If not too ill, the patients were first prepared by washing out the lower part of the bowel

thoroughly until the mucous membrane was relatively clean of all extraneous material. If the patient appeared to be too ill, the study was made at a later date, when the bowel could be properly prepared.

Material for culture was obtained through the proctoscope by means of a curette, and a portion of the base of the ulcer was removed for study from forty-eight consecutive patients. This specimen of tissue was transferred to a sterile test-tube containing 1 c.cm. of physiological solution of sodium chloride and was kept at 37.5° C. for about six hours. The tissue was then macerated in a sterile mortar, with 1 c.cm. of sterile physiological solution of sodium chloride. The technic of Davison was utilized to some extent in culturing the macerated material. A loop full of the material was streaked over a Petri plate of Endo's medium, and then, without flaming the loop, was streaked over another plate of Teague's medium.⁴ A second loop of material was streaked over a plate of von Drigalski and Conradi's medium.¹⁷ After eight hours of incubation at 37.5° C., the plates were set, fully checked for colourless typhoid-like colonies, and in only three cases were they seen.

The suspicious colony from the first case was plated in lactose peptone, but did not cause fermentation. The organisms in a culture that was twenty-four hours old were motile, Gram-negative, and gave a green fluorescent appearance to the broth. Further investigation proved the organism to be *Bacillus pyocyaneus*.

The organisms in the suspicious colonies from the other two cases, after further investigation, proved to be motile, were Gram-negative, and fermented sugar in the manner characteristic of Morgan's bacillus number 1.^{32, 36} In no case was there any evidence of the presence of an organism which did not ferment lactose, a characteristic of the organism of dysentery.

Specimens were also removed in eight other cases and the material diluted at the proctoscopic table in

warm normal solution of sodium chloride and then immediately streaked on plates of Endo's, Teague's, and von Drigalski and Conrad's medium. In this way, less than five minutes elapsed from the time the material was scooped from the wall of the bowel until it was satisfactorily transferred to the incubator, on the various mediums. No organisms which did not ferment lactose grew on any of these.

A parallel group of curetted specimens was prepared in the same manner as that described and cultured according to the technique of Barger³ after Rosenow. The diplo-streptococcus of chronic ulcerative colitis was isolated in forty-five of the forty-six cases under investigation, or in about 80 4 per cent of the cases. Only a single attempt was made to culture in each case.

It is often stated that the serological reactions in of re^{ntery} are uncertain^{16, 42, 43, 53} although many pictur^{rs} claim that they are of the greatest value,^{12, 30, 38}

Th^e that the serum of normal persons does not agglu- of thi^e the organisms of dysentery¹³ Davison stated in det^e the confusion in regard to reliability of the diag- activ^y of bacillary dysentery by agglutination is largely Occa^s to two factors: first, the multiplicity of types of ileu^r. Flexner bacillus makes likely the omission of one more of them in agglutination tests, and the serum c^f some patients which might agglutinate one or more th^e of the omitted types, may be reported as negative; m^e second, living cultures are frequently employed as or^{nt}igens. Living cultures vary from time to time b^y in their agglutinability, therefore, agglutination tests made with cultures of organisms of dysentery, killed by formol, are much more reliable.

In cases of long-standing infection with organisms of dysentery, it is difficult to ascertain from the literature the length of time agglutinins may persist in the patient's blood. Davison reported four cases in children, in which agglutinins were found to be present after six months. With such meagre information at

hand it is evident that further studies should be made in regard to the condition of the patient's blood long intervals after the infection is known to have occurred.

diagnostic purposes

The ages of the patients ranged from fifteen to fifty years, inclusive, seven were in the second decade of life; twenty in the third, nineteen in the fourth, and ten in the fifth. Thirty were males; twenty-six were females

The duration of symptoms, which were of the type caused by an inflammatory ulcerative disease of the intestine, varied from one month to twenty years. A fair number of patients had had symptoms for only one month to several months. These patients were acutely ill, and presented fever, general malaise, exhaustion, anæmia, and frequent bloody, purulent, rectal discharges. Those who had been afflicted for a longer time, usually had had many acute exacerbations, and finally, continuous trouble. All had had symptoms of ^{rel} in variable degree, to which might be added ^{picture} for all of the following additional complaints.

The ^{cramps}, urgency, gaseous dyspepsia, flatulence, of the st, tenesmus, and discharge of varying amounts in the ^{rectum}

The sigmoidoscope in all cases revealed the usual ^{Occa} sional, easily-bleeding cedematous mucous membrane. The wall was studded in some cases with ^{abscesses}, in others, the disseminated, shaggy, ^{ulcers} of the secondary type were present.

The extent of involvement of the colon varied. It was determined by roentgenographic and roentgenoscopic examinations after barium enema. In all cases ^{the} rectum and sigmoid was extensively diseased, in ^{twenty-four}, the entire large intestine was involved in the ulcerative process; in nine, disease of the colon

above the sigmoid was not demonstrable by roentgenologic methods. In the others the extent of the disease varied, in some involvement extended proximally as far as to the splenic flexure, in some to varying portions of the transverse colon, and in some to the hepatic flexure. The typical roentgenological picture produced

by this disease has been graphically described elsewhere.^{4, 5, 7, 50}

The degree of anæmia varied, but all patients were anæmic. The lowest concentration of hæmoglobin, estimated by the Dare method, was 25 per cent. Increase in the leucocyte count was common, but it was not high; in any case the maximal number of leucocytes in a cubic millimetre of blood was 18,000.

Repeated search for parasites in the stools and rectal discharges of forty-seven of these patients gave negative results. In the rectal discharges of one of the remaining nine patients, *Entamæba histolytica* were found. Eight harboured organisms that apparently were of little, if any, significance from the standpoint of pathogenicity, these included *Entamæba coli*, *Endolimax nana*, *Chilomastix mesnili*, and *Trichomonas hominis*.

The diplo-streptococcus of chronic ulcerative colitis was isolated from cultures made from material obtained by curettage of the intestinal walls of forty-five of the patients; from two a Morgan bacillus number 1 was isolated, and from one *Bacillus pyocyaneus*; no other organisms that did not ferment lactose were isolated. Dysentery bacilli of any kind did not grow in any of the cultures.

Agglutination tests, in which the serum of twenty of the patients and specific organisms were used, gave the following results. There was no agglutination of the Shiga bacillus by any of the twenty serums. There was agglutination of the Flexner bacillus by only two of the serums, one in dilutions of 1 to 10, and the other in dilutions of 1 to 20. There was no agglutination of the Hiss-Russell bacillus by any of the twenty serums. There were the following agglutinations of the Strong bacillus, respectively, by the serums of five patients in dilutions of 1 to 5, 1 to 10, 1 to 10, 1 to 20, and 1 to 20. Two of these serums were the same as those in which agglutination of the Flexner bacillus took place. The reason why such agglutinations are not significant

have been given earlier in the paper.

SUMMARY

Fifty-six cases of chronic ulcerative colitis have been studied consecutively. The bases of ulcers in properly prepared colons have been curetted and cultures for bacillary dysentery and the diplo-streptococcus of chronic ulcerative colitis have been made from the curettings. We were unable in any case to isolate any organism simulating organisms of dysentery. In only three cases did we find organisms which failed to ferment lactose, and these proved to be *Bacillus pyocyaneus* in one case and Morgan's *Bacillus* No 1 in two cases. The diplo-streptococcus of chronic ulcerative colitis was isolated in forty-five of the fifty-six cases under investigation, or in about 80·4 per cent. of the cases. The agglutination tests did not suggest that any of the patients studied were ever infected with bacillary dysentery.

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if the patient coughed spontaneously, or did so by instruction during the examination. The examiner does well to wear a muslin veil when practising this last method

The administration of *potassium iodide* for a few days, if not otherwise contraindicated, facilitates the expulsion of sputum

Early *general wasting of muscles* is characteristic, and a suggestion for diagnosis is afforded by palpation of the supraspinous fossæ of the scapulæ, or the lower end of the quadriceps extensor cruris above the patella. The diagnosis often lies between tuberculosis and cancer, and, in the presence of laryngeal symptoms, early wasting and cachexia are, on the whole, more characteristic of tuberculosis

There are many *other causes of persistent hoarseness*, and among them is epithelioma of the vocal cord, the early detection of which is of vital importance, as its successful eradication by operation can be almost guaranteed if it is dealt with at an early stage, and remarkable results have been obtained from treatment by radium. It need, therefore, hardly be said that delay in submitting the subject of persistent increasing hoarseness to laryngoscopic examination is most dangerous. Simple growths on the vocal cords and paresis or paralysis of the internal muscles may also produce disturbance of voice.

Another most important cause of hoarseness and cough is a form of laryngitis produced by the *inhalation of septic or irritating fluids from the nose* by way of the naso-pharynx. The laryngoscope then often reveals small greenish crusts of inspissated muco-pus on the vocal cords and walls of the larynx. The condition in question sometimes gives rise to suspicion of tuberculosis, and has been called "pseudo-phthisis." The presence of muco-purulent discharge in the nasal fossæ or accessory sinuses puts us on the right track, and the great improvement effected by irrigation of

that although not strictly "fool-proof" it is, at least, comparatively safe. It is important that the angle between the points and the shank should not be a right angle but larger, approximately 110° , so as not to

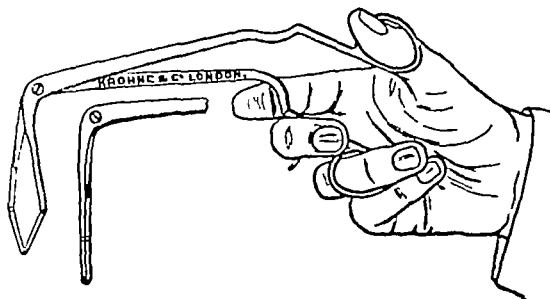


FIG 1 —The author's safety endolaryngeal forceps

impinge on the anterior wall of the trachea which runs downwards and backwards

In illustration the section (Fig. 2) is from a portion



FIG 2 —Typical epithelioma (Previous diagnosis, tuberculosis)

of tissue removed for microscopical examination in a case sent from a reliable laryngological clinic as one of tuberculosis. The resemblance was extremely marked, but the microscope showed that the disease was really epithelioma. Similarly the section (Fig 3), which is

manifestly tuberculosis, is from a patient who was sent to the Cancer Hospital as a case of epithelioma of

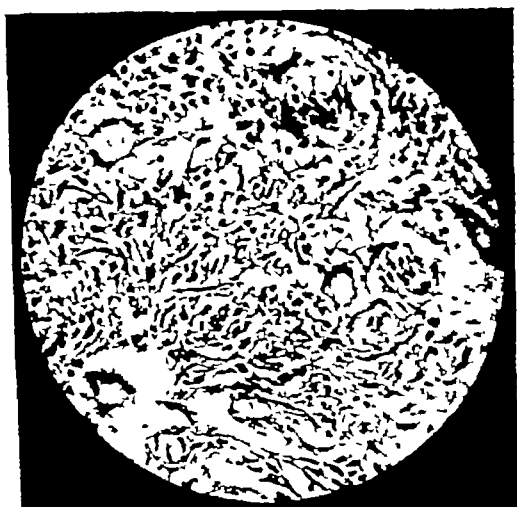


FIG 3 —Tuberculous tissue with typical giant cells
(Previous diagnosis, epithelioma)

the larynx

TREATMENT

By far the most frequent symptom of laryngeal tuberculosis is *hoarseness or loss of voice*, due to infiltration or ulceration of the vocal cords. For this condition much may be accomplished by means of local applications, but a much more valuable remedy, and one more easily available, is rest of the parts by the maintenance of *complete silence*. This is easy to order, but it necessarily puts a great strain on the determination and cheerfulness of the patient. A very distinguished *confrère* kept silence for six months and made a complete recovery. A lady under my care did the same so conscientiously that when the condition of the larynx justified her being permitted to speak she had so completely lost the faculty that it was some time before she could find her voice. She also has been well and hearty for many years.

Discretion has to be exercised according to the

be caught in these cavities and will deposit in them such bacilli and cocci as they may contain. This view receives support from the investigations of Wotzilka and Adler, communicated to the recent International Congress at Copenhagen on the X-ray diagnosis of tuberculosis of the larynx. The observers describe appearances indicating the development of tuberculous infiltration in the ventricles even in cases in which the laryngoscope failed to find evidence of its presence.

The question then arises, how we are to introduce remedies into these backwaters, the ventricles. From the above it seems clear that if we inject liquids into the trachea they will in part be coughed up and driven into the said ventricles. The most obviously effective method is for the expert to inject the fluid into the larynx and trachea by means of an intralaryngeal syringe of such type as Bronner's or Watson Williams's (to the latter of which I have had an extra long tip adapted for the introduction of lipiodol when required).

There is, however, a simple method which the practitioner or nurse, or even the patient himself can carry out, namely, *the transnasal method*. This consists in pouring slowly into the nose about a fluid drachm of a bland medicated oil such as a one in twenty

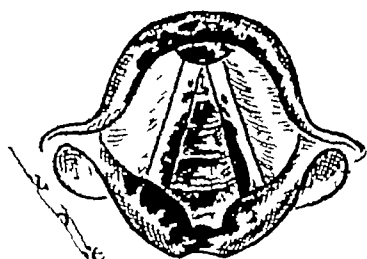


FIG 4

Fig 4 —Methylene blue in oil, seen in larynx after transnasal instillation.

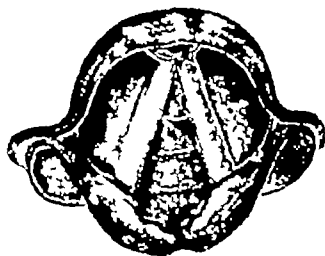


FIG 5

Fig 5 —Powder seen in larynx after inhalation by Leduc's tube.

solution of eucalyptol in oil of sweet almonds, with the head thrown well back and the mouth open. The patient

takes deep panting breaths and makes every effort to avoid swallowing. If the oil is tinged with a little methylene blue it can be seen (Fig 4) by the laryngoscope to have entered the larynx and even the trachea.

It is most important that *relief from pain in swallowing* should be obtained both from the local and general points of view. The pain as such is a source of misery and, if it is so intense that the patient avoids eating, a very serious loss of resistance ensues with rapid increase in emaciation and speedy dissolution. The following instance illustrates this point and at the same time emphasizes the value of the galvano-cautery applied to a localized ulcer for the relief of pain, though only in the hands of an expert.

A young lady under my care with advanced laryngeal disease and comparatively quiescent pulmonary involvement was making good progress, certainly not losing ground. A week later she appeared looking thin and worn-out, as if she had taken a "turn for the worse." It was found that she had suffered so much pain in swallowing that she had almost given up food with consequent weakness and emaciation. I was able to localize a comparatively small ulcer on the left ary-epiglottic fold and applied the galvano-cautery point. With a rapidity which was almost uncanny her pain vanished and she returned a week later looking as well as before, having been able to take her food once more without pain.

Far and above any other simple means of relieving pain arising from tuberculous ulceration of the larynx is the inhalation of a local anæsthetic (anæsthesin and orthoform, in equal parts) in the form of a powder by means of Leduc's tube. This consists of a glass tube about ten inches in length, one end of which is pushed to the back of the patient's throat, while the other is placed in a small saucer containing the powder to be inhaled. The end in the throat is curved downwards for about half an inch through an angle of 60° , the opposite end is bent down for three inches so as to dip conveniently in the powder. The lips are compressed firmly round the tube, and if a sharp sucking inspiration is made, some powder is drawn into the larynx. Fig 5 gives a good idea of the distribution of the powder in

the larynx after inhalation

Occasionally we find a patient on whose larynx the powder has an irritant action. An emulsion containing menthol and anæsthesin is then sometimes effectual. It is made as follows: Menthol, 24 grains, pulv. gumm. acac, ol. amygdal., aq. dest., of each $2\frac{1}{2}$ dr. *Fiat emulsio et adde* Anæsthesin, $1\frac{1}{2}$ dr.; sp. vin. rect., 10 dr., aq. dest., 2 oz. Mix and shake well. It may be swallowed or applied to the larynx by means of a curved brush or by the transnasal method. Unfortunately anæsthesin and orthoform are not soluble in liquids suitable for spraying except to such a small extent as to be almost inert.

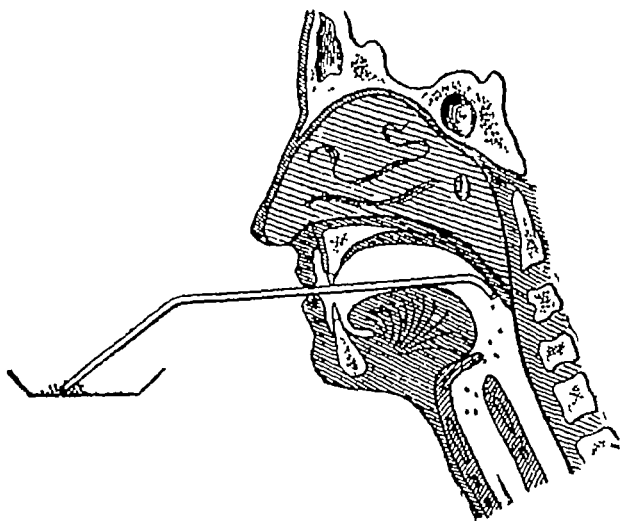


FIG. 6.—Leduc's tube for powder inhalation

Leduc's tube is excellent for the inhalation of all healing powders, of which one of the best is di-iodoform (Adrian, Paris).

Among our most valuable ultimate resources in the treatment of pain in swallowing must be included *blocking the superior laryngeal nerve with alcohol*, a proceeding which is easily carried out by the specialist but which "on a pinch" the practitioner might

perform without much difficulty. A two cubic centimetre syringe with a needle about twice the thickness of an ordinary hypodermic one, more obtusely bevelled at the point and furnished with a groove at a distance of one centimetre and a half from the tip, is all that is necessary. The solution I use is the one devised by Sir James Purves-Stewart for the fifth nerve, and consists of 2 grains of hydrochloride of eucaine in 1 ounce of 80 per cent alcohol. The *modus operandi*, as I practise it, is as follows

The patient is placed in a semi-recumbent or horizontal position and the operator stands on the side on which the injection is to be performed. The neck is sterilized with tincture of iodine or alcohol and the operator's hands with alcohol. I then pass my left hand over the patient's chin and grasp the larynx with my left thumb and fingers, pulling the larynx toward me with the fingers and feeling for the thyro-hyoid space with the thumb, noting a spot about one centimetre in front of the tip of the great cornu of the hyoid bone, or directly above the oblique line for muscular attachment on the thyroid cartilage, and close above this cartilage. The needle, detached or else fixed upon the syringe, is inserted perpendicularly to the skin to the depth of about a centimetre and a half, varying slightly according to the thickness of the superjacent soft tissues. If blood comes from the needle this should be withdrawn and reintroduced at a slightly different spot. The syringe, if detached, may now be screwed on and a few drops of the alcohol should be injected. This generally causes slight smarting and the patient is instructed to raise the hand when the smarting stops. One c cm or a little more may then be injected. In order to make sure that there has been no penetration of a vein, the syringe, if attached, may be screwed off and then re-adapted, or a very gentle aspiration may be made, to see whether a drop of blood passes into the syringe.

If the injection has been successful the patient, when asked after a couple of minutes to swallow, will do so expecting to have the usual pain, but instead of making a wry face he will break out into smiles. The relief afforded often lasts for weeks.

It may be remembered that the epiglottis has less of its nerve-supply from the superior laryngeal and more from the glosso-pharyngeal nerve than the rest of the larynx, so that in pain from ulceration of the epiglottis the results of this injection are not so certain as when the disease is situated in the other parts of

The Importance of Laryngoscopy in the Diagnosis of Pulmonary Tuberculosis

By R. SCOTT STEVENSON, M.D., F.R.C.S.E.

Senior Assistant Surgeon to the Metropolitan Ear, Nose and Throat Hospital

THIS short article is intended to emphasize to physicians and general practitioners the importance of examining the larynx when attempting to come to a conclusion in the diagnosis of pulmonary tuberculosis. I raised the point previously, in 1929, at a joint discussion between the Sections of Tuberculosis and Laryngology of the British Medical Association at Manchester. I said then, with considerable diffidence in such a meeting, that my experience had led me to realize that while practitioners were accustomed to inquire about the family history and the early symptoms of pulmonary tuberculosis from a patient, make a competent examination of the chest for physical signs, have the lungs X-rayed, keep a careful temperature chart, have the sputum examined and make (on occasion) cutaneous tests for tuberculosis, they seldom seemed to take a look at the larynx or have it examined by a laryngologist, yet this not infrequently would give them as much information as all the other methods of diagnosis put together.

The truth of this statement¹ seemed so self-evident that I did not pursue the subject at the time. After

all, in Osler's textbook of medicine it is pointed out, in discussing the diagnosis of pulmonary tuberculosis, that "the group in which throat and larynx symptoms precede the manifestations of pulmonary tuberculosis is a very important one"¹ I have recently, however, encountered a number of cases that compel me to return to it, to beg practitioners to remember that examination of the larynx may clinch the diagnosis of pulmonary tuberculosis beyond the shadow of a doubt, and to repeat the dictum of Chevalier Jackson that no patient should be allowed to remain hoarse for three weeks without having the larynx examined by a competent observer

Case 1—G B, a young man, aged 31, consulted me because he was very hoarse and had a lecture to give that night On inquiry, I found that he had been hoarse for five months His practitioner told him that he had a "nervous throat," and was treating his nerves, his chest had been examined by four different doctors, as he had not felt satisfied about his lungs, but all of them had assured him that there was nothing the matter with them He had no cough, but he thought he had lost a little weight His sputum had been examined, with negative results

One glance at his throat revealed the condition shown in Fig 1 tuberculous infiltration of the arytenoids and ulceration of the left vocal cord A cocaine spray helped the patient through his lecture, and arrangements were then made for him to enter a sanatorium

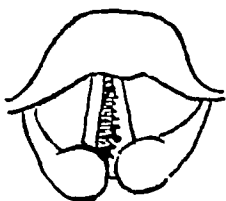


FIG 1.

Case 2—A M, a young man, aged 30, was sent to me by a physician for examination of his larynx He had had influenza six months previously, and hoarseness came on soon after that He was coughing up a lot of sputum, and the physician said that he considered the chest suspicious, but that there were no definite signs of pulmonary tuberculosis He brought a letter from his own doctor, who said that he thought the throat condition entirely nervous, because the patient had no trouble in swallowing solids, but swallowing liquids always brought on a fit of coughing

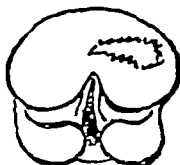


FIG 2

Fig 2 shows the condition of the larynx tuberculous infiltration of the arytenoids, turban-shaped infiltrated epiglottis, and tuberculous ulceration of the epiglottis—almost too advanced for treatment even in a sanatorium The reason why solids were swallowed easily, but not liquids, was obviously

Concealed or Unobserved Mastoiditis

By RICHARD WARREN, M D , M Ch , F R C S

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London Hospital*

INFLAMMATION of the mastoid antrum and surrounding cells is by far the most important feature in suppurative disease of the middle ear. The infected middle ear when draining by the Eustachian tube or by a perforation of the tympanic membrane can probably deal with the greater number of infections of its mucosa without the latter spreading to the underlying bone and causing caries. The mastoid antrum on the other hand, which I believe is always infected in otitis media, with its thin mucosa and general inability to drain readily, is liable to remain infected, and should the aditus to the middle ear become blocked by œdema, polypi, etc., the infection readily spreads to the bony wall of the mastoid and thence to (1) neighbouring parts, such as the meninges, brain and lateral sinus, or (2) the system generally, as bacteriæmia or pyæmia.

In most instances the mastoid is infected by way of the Eustachian tube and middle ear in an ascending manner. Primary mastoiditis as a blood-borne infection, either pyogenic or more likely tuberculous, occurs occasionally. I suspect that a good many cases, where the mastoid flares up rapidly, in the apparently early phases of otitis media, are really of old standing, there being adequate drainage via the Eustachian tube, or a perforation in the drum to avert temporarily the catastrophe; or the infection may possibly remain quiescent and latent like a chronic abscess of a long bone (Brodie's abscess). Many cases of suppurative otitis

media, and presumably mastoiditis, are quiescent, there being little discharge so that the patient may not seek medical advice and thus escape notice till the flare-up takes place.

Local signs.—It is important to realize that local signs are often slight or absent, œdema over the mastoid with displacement of the ear forwards is definite evidence that the case is not an early one. Those who wait to diagnose mastoiditis till œdema on the surface appears will neglect many cases which need operative treatment. Pain and tenderness over the tip of the mastoid are important, but not constant, appearing and disappearing in such a way as to delude the observer into the belief that the condition is not severe. Œdema of the posterior wall of the deeper (bony) part of the auditory meatus seen when inspecting the membrana tympani has long been noted by otologists as an important sign more often in the cases met with the œdema has spread all round the meatus making it impossible to get a good view of the drum. In such cases the mastoid should always be explored. Further, a furuncle in the meatus may be mistaken for mastoiditis if care be not exercised; but one must also remember that furuncles are likely to occur in the presence of otorrhœa and may be associated with a severe mastoiditis. In brief, one's mental attitude when dealing with a case of otorrhœa should not be "Why should I operate on this case?" but "Dare I leave this mastoid unexplored?"

General signs—Vague general seediness with or without pyrexia, headaches, and drowsiness, associated with a discharging ear, are signs urging that the mastoid trouble is advancing and may shortly lead to the more serious complications mentioned above. In one instance hæmaturia brought the patient into hospital and this proved on exploration to be due to very extensive mastoiditis with wide destruction of bone. Opening the mastoid early is the surest way of

front edge of the sigmoid sinus.

More commonly, however, one opens into cancellous bone containing pus and granulations in its spaces. Removing these and tracking up fistulæ which exude pus one arrives at the antrum which is known by passing a small probe gently into the adit. The next stage is to thoroughly remove all diseased bone, since a failure to do this completely is I believe the commonest cause for relapses after operation or failure for suppuration to cease.

Nor is the matter always easy, for groups of suppurating cancellous cells having fairly thick healthy looking walls may communicate by tiny fistulæ with the main cavity. It is necessary to pick and probe with a fine instrument all over the interior of the cavity before the presence of a sequestrum can be eliminated. Sometimes in so doing one traces a fistula through into the interior of the cranium and thus may drain an extradural abscess which has been lurking there.

Methods of concluding the operation—Having now removed diseased bone, opened up fistulæ and rendered the cavity as regular and smooth-walled as possible, the next question is how to conclude the operation. It is the old proposition of how best to cause a cavity in bone to heal. To some degree this is possible by sloping the edges of the pit so that the depression becomes saucer-like enabling the overlying soft tissues and integuments to subside to the bottom of the cavity. But this is only possible to a limited degree, for in the deeper mastoids efficient saucering would encroach to an impossible extent on the middle fossa of the skull and the sigmoid groove. There are several methods possible.

(1) Leave the incision behind the ear wide open cr nearly so and pack to the bottom gradually diminishing 'up' pack as the bone cavity granulates, scar tissue is needed, and epidermis grows over from the edge of the open wound. This plan is safe but will leave an ugly depressed scar covered with thin epidermis. It

is useful for the more severe type of case where much bone has to be removed and perhaps the interior of the skull drained

(2) Partially or almost completely close the operation wound packing through a small opening for a few days then remove packing entirely and allow to heal. The difficulty is to know when to leave out the packing and let the wound close. A good many cases will heal under such treatment, but there is always a considerable chance that the mastoid will be filled not with healthy scar tissue but with granulations of a poor type which, ultimately, break down forming a fistula behind the ear.

(3) More cosmetic results may be obtained by closing the operation wound behind the ear completely and draining through the meatus which is enlarged by a plastic operation. There are two main types of this operation (A) the radical (Stacke), the (B) conservative (Heath)

(A) In the radical operation, after clearing diseased bone from the mastoid and its surroundings the "bridge" i.e. the bone remaining between the bony meatus and the opening into the mastoid is removed thus causing the mastoid adit and tympanic cavity to form one large cavity, the remains of ossicles and drum are removed.

(B) In the conservative method of Heath, at a similar point in the operation the "bridge" is also removed but only in part—namely, down towards the tympanic membrane as far as may be deemed safe. After this the procedure is much the same, viz., the cartilaginous meatus is slit up into the concha from which a single or double flap is fashioned and turned inward so that the remade meatus is an opening about $\frac{3}{4}$ inch in diameter leading down to the tympanum and mastoid. The opening is kept wide by a large tube for some days and the cavity carefully packed and dressed. The mastoid cavity becomes healed partly by falling

Mastoiditis, Its Diagnosis and Treatment

By H. NORMAN BARNETT, F.R.C.S.E.

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THE practitioner may rightly complain that he is without a rudder in a difficult sea when considering the subject of mastoiditis. The nomenclature has changed in its significance, and the old is used alternatively with the new, till the subject has become a very confused one. To gain a clear understanding it will be necessary first to consider the acute affection of the tympanum or middle ear. This usually has its origin in microbial infection of the naso-pharynx, and gains admission by the Eustachian tube. It sets up inflammation and is known as otitis media; whether this is designated as "dry," "moist," "catarrhal," "acute," "chronic," or "suppurative" makes little difference, for all are different steps or signs of the same condition, and it is exactly like inflammation anywhere else with its varying signs of "resolution," "ulceration," and "suppuration," only differing in the fact that it occurs in a small bony chamber lined with mucous membrane, which is walled on the outer side with an opaque substance, the tympanic membrane, which is liable to burst from internal pressure and a passage in the upper part of its inner wall—the iter—into the antrum of the mastoid bone. If these facts are appreciated, and the

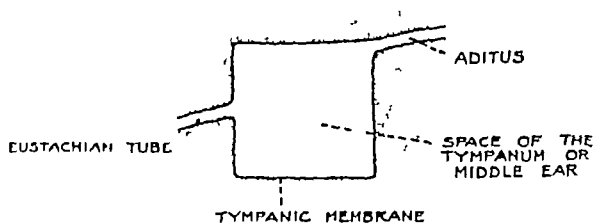


FIG. 1.—Diagram of the tympanic tract (magnified two and a-half times)

mass of confused and meaningless terminology banished from his mind, the practitioner will understand the subsequent events with clearer understanding, and by easy deduction will make his diagnosis.

When inflammation is set up in the middle ear by infection through the Eustachian tube, pain is produced by the swelling of the mucous membrane lining the chamber. If prompt measures are now taken by means of such a remedy as warm colloid silver drops, the inflammation may subside: if, on the other hand, the infection is of a very acute nature, or is allowed to proceed without interference, the pain will increase and secretion will take place from the mucous membrane, gradually increasing in amount till the small space of the tympanum is filled and pressure exerted on the tympanic membrane.

A great deal will now depend as to subsequent events on the strength of the membrane: if it is thick and strong, the products of inflammation will tend to find their way towards the mastoid antrum, and mastoiditis is set up: if the membrane is not strong, the pressure from within will cause perforation, and middle ear discharge is set up.

It may at once be stated that the size of this chamber under consideration is so small that it is quite incapable of holding any quantity of pus. It will, therefore, at once be seen how inaccurate it is to say that a person is suffering from middle ear disease only when a profuse discharge comes and continues to come from the ear. There is no room for this material in the tympanic cavity, and the only place it can come from is the mastoid antrum and cells.

If extension to the mastoid has occurred, the patient should be considered as suffering from a serious disorder, and should be confined to bed, or at least to the house, wearing a flannel otitis media cap such as Heath's, while warm drops of H_2O_2 , followed by 1 in 60 carbolic in rectified spirit should be put into the

made

It is sufficient that there should be pain with tenderness on pressure over the antrum or tip cell combined with a discharge too profuse to come from



FIG 3 —Illustration of acute mastoiditis

the cavity of the tympanum, and therefore, as previously pointed out, coming from the mastoid area and varying in character according to the time it has been present. Some consideration also should be given to the constitutional reaction, as there may be considerable rise of temperature with malaise, but *it cannot be emphasized too much that an acute mastoiditis with considerable destruction of bone may be present with little or no constitutional symptoms*, or, again, that the latter may rapidly pass off, although there is advancing bone disease of the mastoid. This constitutes one of the dangers of failure to diagnose the condition present.

If then a case presents itself with the history that

there had been some pain for one or two days, followed by a discharge from the ear which still persists, and has the character above mentioned, and there is found to be some pain with tenderness opposite the centre of the external auditory meatus or at the extreme tip of the mastoid process with or without constitutional symptoms, the case should be kept under observation as a probable mastoiditis. The treatment adopted should be confinement to bed with disinfection of the middle ear, and counter-irritation behind and in front of the ear with the application of warmth by means of three layers of cotton wool under an otitis media cap, and promotion of efficient drainage if necessary by enlarging the perforation of the tympanic membrane.

If the condition does not clear up with almost complete cessation of discharge within a few days, an exploratory operation should be carried out. It is the failure to do this that comprises one of the great mistakes in handling mastoiditis at the present time. In the vast majority of cases failure to operate will lead to a long period of quasi-convalescence at the end of which there may be a temporary cessation of discharge and the patient will be discharged from observation on the assumption that he has been suffering from an acute middle ear disease and that he is now cured. The truth being that he has been discharged with a more or less quiescent osteitis or osteo-myelitis present, to reassert itself on a subsequent occasion as a discharge from the ear, when the case will probably be labelled as chronic suppurative otitis media. In reality it has now become a chronic mastoiditis with the middle ear acting as an effluent drainage tube for a diseased mastoid bone.

If operation is decided upon at the proper time, and the mastoid antrum opened, the subsequent steps taken will depend upon the condition found, but generally speaking the type of operation to be carried

there may be no other symptoms than that of a discharge from the external auditory meatus. This constitutes in nearly every case the "running ear"¹ of everyday experience, and is the condition usually put down to and described as chronic suppurative otitis media and uselessly treated by means of drops in the external auditory meatus.

The treatment in such cases where there is no danger sign, should be to thoroughly disinfect the ear with 10 vols. warm peroxide of hydrogen and 1 in 60 carbolic in spirit used several times a day. If this within a week does not produce abatement, zinc ionization should be tried in the external auditory meatus, first having carefully cleaned the ear, with ether if necessary. If, after application of this for, say, six treatments, the discharge has not abated and other symptoms persist, an operation should be carried out on the mastoid, and the best type is a modified radical²

This operation removes all diseased bone, but leaves the functional apparatus of the middle ear. It provides, however, a route whereby the middle ear can be washed out from behind, and treated in such a way that this chamber recovers its normal condition. The result is that, in favourable cases, the patient has been relieved of a dangerous disease—chronic mastoiditis—and his hearing improved and usually, restored to normal. Such an operation should, in the majority of cases, be undertaken in preference to the old fashioned so-called radical mastoid, since it achieves the purpose of the latter with, as a rule, better surgical results and, in addition, saves the function of hearing, and because of this will be much more readily submitted to by the patient.

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¹ Barnett, H. Norman "The Running Ear" *Brit Med Journ*, 11, 1929

² *Idem* "Modified Radical Mastoid Operation" *Proc 1st Congress International D'Oto-Rhino-Laryngologie*

Speech Disturbances in Cases of Parkinsonism

By E. STOLKIND, M.D.

Late Assistant Physician to the Moscow Municipal Hospital

THIS is a brief account of an investigation of the speech defects in Parkinsonism or post-encephalitic paralysis agitans, the most common sequel of epidemic encephalitis. It is the first attempt to use both the graphic method of recording the speech in this disease and examination of the soft palate and vocal cords as well as the usual investigation by ear. Peculiar speech defects are among the pathognomonic signs of Parkinsonism, they may even be the first to appear, and in this event have led to an incorrect diagnosis; thus some of my patients in whom the speech defects appeared in advance of other signs, had been treated for these by removal of tonsils and adenoids or even of all their teeth before Parkinsonism was recognized.

In the differential diagnosis it is important to bear in mind the speech disturbances in other nervous diseases, e.g. in pronounced cases we can distinguish by the ear alone the scanning speech of staccato character in disseminated sclerosis, the thick, slow, irregular "hot-potato" speech in Friedreich's ataxia, the indistinct nasal disarticulate speech in progressive bulbar paralysis; the stumbling, slurring speech in progressive paralysis of the insane. The speech is also pathognomonic in other cortical lesions (aphasia) as well as in hysteria (aphonia). There was slow, hesitating speech in a case of chronic medullary poisoning which I described in 1926. Also, in many cases of epilepsy the speech, especially in reading or reciting, is monotonous, expressionless and peculiarly high and

Saliva dribbles slightly when she speaks Movements of the soft palate and vocal cords are normal

These two cases are instances of post-encephalitic paralysis agitans, in which the first obvious symptoms were the abnormalities of the speech.

Case 3—Male, aged 28 Eleven years ago had "influenza" Gradually the speech became slow, mouth was generally open and tremor developed Tonsils and adenoids, to which slowness of speech and open mouth were attributed, were removed I found signs of Parkinsonism with slow, hesitating and unintelligible speech His condition has been more or less stationary for the last nine years Soft palate does not move when speaking, but there were strong symmetrical movements when he was asked to say "ah" Tension of the vocal cords slightly reduced Simple laryngitis

Case 4—Boy, aged 13, had an acute form of epidemic encephalitis about seven years ago Four years ago signs of Parkinsonism became apparent Speech slow, monotonous Movements of the vocal cords normal and those of the soft palate rather limited Slight laryngitis

Case 5—Female, aged 21 Her speech was slow, monotonous and dull, she is usually incomprehensible Speaking tires her She can sit for days without trying to speak Her soft palate moves slightly The movements of her vocal cords are normal, and there is no laryngitis

The laryngoscopic examination in advanced cases is very difficult as the patients cannot open the mouth wide and put out their tongue

These charts show the melody with which the sentence "I'd like to go home" was spoken. The first chart is that spoken by a normal person. The others are spoken by persons with Parkinsonism. The inscriptions show how the sounds are greatly lengthened in this disease; the chart 5 (Case 4) appears shorter because the *H* was dropped. The waves are small owing to the high pitch of the voice. In the normal graph the melody is seen to rise and fall, but in these there is a marked lack of small fluctuations, and, except in the case of 3, there is also monotony

Part of the *treatment* of Parkinsonism should be devoted to the speech, and should consist of voice and breathing exercises with such aids as the gramophone, etc. Occasionally the fitting of a mechanical appliance

in the mouth may be effective for a time.

CONCLUSIONS

(1) The speech in cases of Parkinsonism invariably shows some defects. It is generally slow, hesitating or jerking, unintelligible or incomprehensible; in late stages complete mutism may appear.

(2) The speech records show the extreme slowness, monotony and marked lack of small fluctuations, and are of assistance in diagnosis. By recording the speech at intervals the progress of the disease can be noted.

(3) During an actual examination the soft palate is found to be movable and it is seldom that, even in advanced cases, the movements are then limited. But in actual speech they become

(4) The majority of the patients show the through the mouth, and in these cases the movements are found.

(5) The movements of the soft palate (abduction and adduction) are generally normal. In the severer forms, or when the movements diminish, the eye may

This interesting feature of the behaviour of the muscles of the face which, though usually quite flexible by a simple command, etc.

(6) The speech defect is due to the muscles of the face, sometimes there is impairment of speech function

I am indebted to Mr. J. H. Laryngoscopic examination and Miss F. Janvrin for their

P

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Stolkind *Proc Roy Soc Med*

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Fat Children

By W F CHRISTIE, M D

MANY parents regard corpulence in their children as a portent of good health, or, at worst, a blemish which disappears with age. Left to "grow out" of their fatness, some children grow further into it. In after years they look back and say "I was a chubby baby, a plump child, an adipose youth, and now, I am an obese old man before the age of 40 I fear that the trouble is incurable" A brief survey of the results obtained by treating the childish adiposities will show how seldom such a belief is justifiable

Obesity may be due to dietetic error, to endocrine disorder, or to combinations of these Gross pathological lesions affecting the glands of internal secretion are not considered in this article It would seem that a few children are born fat, but that the majority acquire fatness afterwards

CONGENITAL OBESITY

Babies heavier at birth than ten pounds are uncommon Amongst 3,600 children born at the Rotunda Hospital, Dublin, in only one case was the eleven pound mark exceeded Most natal heavy-weights are post-mature babies, being large rather than adipose. No example of congenital obesity has come under my observation, but they exist. Endocrine disorders occur during intra-uterine life, and, since dietetic considerations do not apply, congenital obesity must be placed in the endogenous group. How else can Wulf's case be explained? "The child died at birth, weighing 18½ lbs It was well proportioned, and looked as if it were three months old, except that it had an enormous development of fatty tissue." Some pre-natal error of metabolism must have occurred

in the mouth may be effective for a time.

CONCLUSIONS

(1) The speech in cases of Parkinsonism invariably shows some defects. It is generally slow, hesitating or jerking, unintelligible or incomprehensible; in late stages complete mutism may appear.

(2) The speech records show the extreme slowness, monotony and marked lack of small fluctuations, and are of assistance in diagnosis. By recording the speech at intervals the progress of the disease can be noted.

(3) During an actual examination the soft palate is found to be movable and it is seldom that, even in advanced cases, the movements are then limited. But in actual speech they become more limited.

(4) The majority of the patients breathe through the mouth, and in these cases laryngitis was found.

(5) The movements of the vocal cords (abduction and adduction) are generally slow but normal. In the severer forms, or when the patient is tired, they may diminish.

This interesting phenomenon is similar to the behaviour of the muscles of the extremities and face which, though usually rigid in such cases, may become quite flexible by a special effort, as after a word of command, etc.

(6) The speech defects are mostly due to rigidity of the muscles of the larynx, fauces, tongue, etc., though sometimes there is in addition dissociation of the speech function.

I am indebted to Mr Lionel Colledge for the laryngoscopic examination and Professor E. Scripture and Miss F. Janvrin for the charts.

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Idem Lancet, 1926, i, 391.

helped to eliminate it from the lower walks of life

(b) The *endocrine* type of infantile adiposity is hypothyroid in origin. Fat cretins are easily recognized, it is the slight degrees of thyroid insufficiency which are difficult. The distribution of fat is again general and uniform, as in obesity of lacteal origin. The history of the child, and one or two cretinoid features, will suggest the correct diagnosis. The mother will recall how it was a fine large baby at birth, but that it began to "go off" some months later, particularly when breast was replaced by bottle feeding. Backward in teething, late in sitting-creeping-walking, slow in talking, it is difficult to teach. The face does not light up with the bright smile of the normal child, in fact, it is rather stupid. One or more, but not all, of the following signs may be discerned: a subnormal temperature, a slow pulse, delayed closure of the fontanelle, sparse, dry, lustreless hair, waxy anæmic appearance, "button nose," thickish lips and tongue, dry cold skin, prominent belly, and constipation. These children respond well to thyroid feeding. For a six-months' child, $1/6$ th grain of dried thyroid extract, made into a powder with sugar of milk or glucose, should be administered once a day, at bedtime. The dose may be increased to $1/2$ grain for a one-year old child. A close watch must be kept for untoward symptoms because, although thyroid may be borne well at first, the child's limit of tolerance to the drug may be reached quickly. It is wise to remember that dietetic errors—and they are not infrequent—must also be corrected. Neither dietetic nor endocrine obesity arising during infancy should be allowed to continue into the juvenile period.

(2) *Obesity in Juveniles.*—(a) *Alimentary.*—In all growing children, a close investigation of their habits will show that the amount of exercise taken and heat generated is less than the energy value of the diet consumed. Growth absorbs the extra food for building

purposes Many children, however, eat more than they require, some are enormous and voracious feeders from an early age, while others delight in rich, fatty and starchy foods—at meal hours and in between “Sugar and spice and all things that are nice,” often in the form of sweets of high calorie value, are added to normal meals For “simple” fatness during the juvenile period, we must blame the parents Many of these children lose weight at school, but gain it at home when dietetic control is relaxed

Clinically, two types of alimentary obesity occur, the sthenic and the asthenic. In both, as in infantile obesity, the adiposity is general In the mild *sthenic type*, which depends on an excessive but well-balanced diet, the complexion is florid, muscular system good, disposition cheerful, and the child is full of energy and go. In the *asthenic type*, which results from an excessive but ill-balanced dietary, the face is pallid, the blood mildly chlorotic, muscles—including the myocardial—are slack, and the child is listless and easily fatigued. Also, he is more prone to specific disease Both types respond well to food regulation Contrary to what one might expect, the obese child makes usually an enthusiastic dieter

(b) *Glandular*—The influence exerted on bodily growth by the secretion of each endocrine gland waxes and wanes according to the age of the child It might, therefore, be expected that obesity due to glandular dysfunction would show a distinctive character at the different ages Unfortunately, a defect in any one member of the endocrine group disturbs other members, hence few cases show classical monoglandular syndromes Moreover, the majority of fat juveniles have also an exogenous basis for their fatness Nevertheless, different types can usually be distinguished, for instance, the even temperament, sleepy

habits and large appetite of Pickwick's fat boy do not prevent us from diagnosing his case as a primary pituitary defect.

Not uncommonly school medical officers discover *thyrogenous* obesity in children between six and ten years of age. Generalized over-fatness is then associated with retarded development. Shortness of stature, delayed ossification of epiphyseal centres, and subnormality of talent give the clue. Other stigmata of thyroid insufficiency may be present, particularly common being the skin changes and constipation. The basal metabolic rate is rarely low enough to be diagnostic. Sometimes failure of dietetic treatment, and success when it is combined with thyroid feeding, is the only sure sign of thyrogenous defect. A half gram of the dried thyroid extract, in powder form, once daily, is usually sufficient to improve a child of six years.



FIG 2.
Thyrogenous
obesity
(short and fat)

Hypofunction of the posterior lobe of the *pituitary* gland occurs between the ages of six and fourteen years, and produces also a characteristic obesity. These cases show the typical pelvic girdle deposition extending from the level of the diaphragm to the middle of the thighs. Sometimes the shoulder girdle is affected also, but the neck and forearms, wrists and hands, lower legs and feet are always free. The skin is soft, smooth and velvety, and the face pudding-like. The intelligence is keen, but the temperament is lazy and placid. The extent of the deficiency will determine the clinical picture. Many cases are slight. In certain families each female member in turn becomes stout as the time of puberty approaches, but slims later when menstruation is established. Many fat, well-grown, bright boys become normal after full develop-

purposes Many children, however, eat more than they require, some are enormous and voracious feeders from an early age, while others delight in rich, fatty and starchy foods—at meal hours and in between. “Sugar and spice and all things that are nice,” often in the form of sweets of high calorie value, are added to normal meals For “simple” fatness during the juvenile period, we must blame the parents. Many of these children lose weight at school, but gain it at home when dietetic control is relaxed

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ment of the gonads. Their happy release from obesity is due to a natural correction of the endocrine balance.

In severer cases, the onset is earlier, and there may be a subnormal temperature, rudimentary

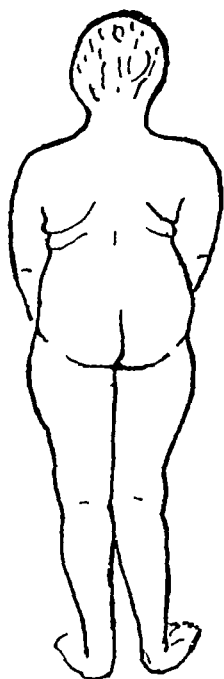


FIG 3
Pituitary obesity

lateral incisor teeth, absence of half-moons on the finger-nails, abnormal blood-sugar curve, or even X-ray changes in the pituitary fossa. Involvement of the anterior lobe of the gland adds striking features. Under-activity is characterized by small stature and late sexual development; over-activity causes large stature and early development of the genitalia. The handicap under which these children are forced to play the game of life, if they are left untreated, is three-fold—mental, sexual and physical. The cure consists of an artificial correction of the endocrine balance, combined often with a lessened dietary. Pituitary acts better when exhibited with thyroid in the

proportion of 2 to 1. Commence with small doses. The earlier diagnosis is made and treatment is instituted, the better the result obtained.

Obesity is sometimes, though rarely, associated with over-activity of the cortex of the adrenal gland. This type occurs in early childhood, i.e. between the third and the eighth year. Besides being fat, these children are overgrown, mentally dull, and show a peculiarly precocious sex development. No treatment is known to be effective.

(3) *Obesity in Adolescents.*—(a) *Exogenous*—This type of corpulence arising during the final phase of childhood is most frequently female. Girls slow their rate of growth between the fifteenth and seventeenth

years; also they become more sedate. Instead of reducing food, they continue to eat as before. Adipose maidens are seen most often amongst strict adherents of the Jewish faith, whose food is oily and rich in caloric value.

(b) *Endogenous* —Obesity of this type, when it arises at this age, is usually subthyroidic. Often the menstrual function is deranged. The hand and supraclavicular padding, so frequently relied upon for diagnosis in adults, may now be seen. The basal metabolic rate is slowed, though seldom as low as 15 per cent. below normal. The exhibition of thyroid orally and, to girls, ovarian extract intramuscularly, may tide them over what is often only a temporary glandular weakness. Sometimes atypical examples of pituitary fatness occur at this age. For instance, fat may be deposited in the buttocks and legs, leaving the face, arms and trunk slender. In my experience this local deposition resists most treatments, but is improved by rest. When glandular adiposity, commencing in the juvenile period, is continued into adolescence, several glands are usually involved. Pluriglandular obesity of several years' standing is difficult to improve.

CONCLUSIONS

The whole subject of obesity in children is obscure, but certain proved facts emerge. Fifty per cent. of fat children belong to the dietetic group which are completely curable. Whether or not they have inherited poorly functioning glands is immaterial to the result. Twenty-five per cent. constitute the thyroid deficiencies, which respond well to glandular therapy. In most instances thyroid feeding must be combined with dieting. Of the remainder, the prognosis needs to be guarded. Some pituitary obesities get better on their own, others improve with appropriate treatment.

Enterospasm, Spastic Colon, or Tonic Hardening of the Colon

By T. STACEY WILSON, M.D., F.R.C.P.

Consulting Physician to the Birmingham General Hospital

WITHIN the last few years attention has been drawn by many writers to an ailment of the colon in which abdominal pain, either dull and aching in character or of the nature of colic, is associated with muscular hardening of the intestine. These cases have been described under the term "spastic colon," a name which appears to be justified by the fact that the colon is felt to be muscularly hardened and that radiographs of such cases can be obtained which show considerable portions of the colon with its lumen reduced to zero.

Some of the best-known records of this condition are those by H. P. Hawkins¹, J. A. Ryle², E. L. Eggleston³, and the complete summary of recent literature by Robert Hutchison⁴.

In a recent article in *THE PRACTITIONER*, Bisset⁵ has also drawn attention to this important subject, and has suggested the possibility that it may be to some extent allergic in character. If, however, hardness and tenderness of the colon be looked for as a matter of routine in all patients examined (as I have done for the last thirty-nine years) it will be found that the symptoms which are grouped under the term "spastic colon" constitute only a portion, and probably the least important portion, of the symptoms which may be associated with this abnormal condition of the muscular wall of the colon. Moreover, the routine palpation of the colon in all cases seen will show that

hardening and tenderness do not only occur under conditions which are explicable by the presence of contractile spasm—as when a radiograph shows some inches of the colon in which the lumen is reduced to zero—but that hardening and tenderness may also occur under conditions which cannot be thus explained. It is by no means unusual to find hard and tender portions of the colon with a definite lumen of an inch or an inch and a-half in diameter.

This type of hardening was discussed at the International Medical Congress held in Paris in 1900, and cases were then described in which portions of the colon were distended as well as being muscularly hardened. Mannaburg, of Vienna, spoke of parts of the colon being distended and as hard as a stone and forming a very tender tumour which the patient could feel. At the same meeting, Jules Geoffroy, in his paper upon “contracture” of the large intestine, spoke of the colon hardening under his hand and forming a tumour which could be grasped like a floating kidney. This last-named experience is one which I myself have often had. It is therefore evident that this ailment is a functional derangement of the colon of a more complex character and with a wider range of symptoms than that described under the term “spastic colon.”

My first introduction to this ailment was in 1892, when I was fortunate enough to have under my care a patient in whom the whole of the ascending colon and cæcum remained hardened and with a diameter of an inch and a-half, for several days, and in whom the hardening was unmistakably due to pure muscular activity. It was also fortunate that I was sufficiently alert mentally to recognize that the condition must be due to some as yet undescribed form of muscular activity. More than ten years elapsed, however, before Sir Charles Sherrington described “postural activity” of muscular fibres, and demonstrated the

existence of a "static" type of activity which was capable of making a muscular tube become rigid without obliteration of its lumen. That such a thing is possible is now well known, for it occasionally happens, during an abdominal operation, that a surgeon will see a few inches of a flaccid piece of intestine suddenly become cylindrical and rise up as an arch closely resembling a piece of rubber tubing of some $\frac{1}{2}$ to $\frac{3}{4}$ inch in diameter. Such a hardened piece of intestine will behave as if its walls were elastic—springing up again after being pressed down and becoming cylindrical again after being flattened. After a few seconds the hardening will pass off and the bowel once more become flaccid. In some cases hardenings such as this will recur during an operation in the same, or in different portions of the intestine.

It will, I believe, be recognized before long that this "static" hardening of intestinal muscles (which may be described as an "elastic fixation" of the protoplasm of some of their fibres) constitutes a normal type of intestinal muscular activity. Whether this be so or not, it is certain that a serious amount of resistance to normal contractile activity in the bowel—whether peristaltic or tonic—can be offered by an abnormal amount of this muscular hardening and that such resistance might well be a source of pain.

Here, then, we have a satisfactory explanation of the various types and degrees of pain which are known to occur in patients suffering from muscular hardening of the colon. The fact that hardening is usually accompanied by tenderness on pressure, and sometimes by very great tenderness, is in harmony with the belief that opposing types of muscular activity are associated when the colon is abnormally hardened.

The symptoms, the etiology, and the treatment of this ailment will be more readily understood if the following statements receive the acceptance which I believe they merit.—

(1) The muscular fibres of the intestine are normally liable to a form of "static" (i.e. non-contractile) activity in which their protoplasm becomes hardened and possesses a measure of elasticity.

(2) This static muscular activity is under nervous control and obeys the laws of reflex activity.

(3) One of the two chief stimuli which may originate this type of activity is the presence in the colon of the kind of vegetable fibre, cellulose, etc., which normally undergoes digestion there.

(4) In this, as in other forms of reflex activity, the amount of muscular response which can be originated by any definite amount of stimulus depends upon the excitability of the reflex nervous mechanism.

(5) An abnormal excess of this static hardening may offer such an amount of resistance to peristaltic or tonic contraction as to originate a condition of muscle strain in the colon wall.

(6) Muscle strain occurring in the colon may either :
(a) originate a sensation of pain if the nervous impulses concerned pass from the sympathetic nerves into the sensory tracts of the spinal cord by way of the rami communicantes; or (b) originate some other type of nervous disturbance if the impulses concerned do not leave the sympathetic system but pass to the brain along the nerve paths which normally subserve the impulses which regulate the muscular activities of the colon.

(7) When an abnormally irritating impulse (such as we are speaking of) reaches the brain by a sympathetic nerve path one of the following effects may be produced : (a) there may be an intensification of some one or more of the general reflexes which afferent impulses from the digestive organs can originate (such, for example, as contraction of the systemic arterioles); (b) there may be an intensification of reflexes more directly concerned with the processes of digestion (such, for example, as abnormal closure of the pyloric

or ileo-cæcal sphincters, modification of right activity, etc.); (c) the disturbing influence of the duct effect upon the brain and occasionally mental state, more especially such, that a depression Under these circumstances, a piece of intestinal misery ("mental pain") will arise up as an intestinal in degree to the abdominal tubing of have been experienced if the rubber tubing of entered the sensory tracts a hardened piece passing to the brain along all were elastic—(The correctness of this statement is pressed down and observation that patients are flattened. After short an attack of mental pain pass off and the causing abdominal pain by passing an operation part of the colon.) In some cases

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PAIN

As most of the pain impulses enter the normal type of the ramus communicantes the pain may be so or resistance to or-segmental character and felt in the the—whether is in relationship with the particular abnormal receives the pain impulse that such When, however, of the colon is sufficiently enlarged and the action of palpable by the patient the pain may be known located in the part of the colon in which the hardening

The commonest situations in which the usually felt are as follows:—A small area in the sometimes hypochondrium representing the ninth dorsal the the ht or left of the umbilicus, represents are t; an area in the right or left iliac e eleventh segment; a small area of or left sacro-iliac joint, represent (more rarely, twelfth e anterior area which occasionally pains may be felt

in the thighs over areas representing the lumbar segments of the cord, and very occasionally over the areas in the legs and feet which are in relationship with the sacral segments of the cord.

These referred pains are usually accompanied by a certain amount of tenderness of the subcutaneous nerves in the area where the pain is felt. This fact makes it easy to distinguish between a referred pain and a true visceral one. Take, for instance, pain in the gall-bladder region: All that is necessary for diagnosis is to make the patient contract the muscles of the abdominal wall (as when raising both feet from the bed) and the tenderness on pressure will be greatly intensified if the pain be a referred one, for the tender subcutaneous nerves will be pressed against the hardened muscular layer. If, on the other hand, the tenderness be due to the gall-bladder it cannot be elicited when the abdominal muscles are contracted.

An important diagnostic point in connection with pain of colon origin is its liability to occur at times when the colon is functionally active. Of these, the most characteristic is the period between midnight and 4 a.m., when the colon is presumably preparing for the morning evacuation of the bowels. When a patient is awakened with pain in the small hours of the morning it is almost certain to be of colon origin and to be easily curable. Colon pain is also liable to occur after meals and, if the transverse colon be involved, the muscular activity in the colon which would be set up by the vibration of a vehicle or by walking may originate colon pain.

MENTAL SYMPTOMS DUE TO HARDENING OF THE COLON

It is of great importance that the practitioner should recognize that a very considerable portion of the cases with abnormal mentality which come under his care, are due to this ailment of which we are speaking, and that when colon hardening gives rise to mental

symptoms, no abdominal symptoms of any kind may be present. The diagnosis rests simply on the fact that the colon can be felt to be tender and harder than normally, more especially in the right or the left iliac fossa, or both. Occasionally a case with severe mental disturbance is met with in which the abdominal colon is normal on palpation but the rectum is found to be very hard and tender.

Other points of great diagnostic value are that the mental symptoms are liable to be severe between midnight and 4 a m., on first waking in the morning, after meals, or as the result of mechanical vibration. Sometimes a patient will be unable to travel in a vehicle over a rough road because of the uncontrollable fear which is originated by the jolting.

The most common type of mental disturbance is *neurasthenia*, which may vary in degree (according to severity of the case) from simple unhappiness up to severe suicidal melancholia. A more general recognition of this fact in the past would probably have prevented many a case of nocturnal suicide. Some form of morbid anxiety is also very common, and its degree may vary from simply a tendency to over-anxiety or worry up to very definite phobias or obsessions. Various types of suspicion are also very common. In children deficient power of application, inattention, and the lack of mental balance which characterizes "the difficult child" may be due to this ailment and be readily curable in a few weeks by simple treatment. In such cases also there may be few or no abdominal symptoms.

NEURASTHENIA IN RELATION TO COLON HARDENING

The abnormal mentality due to this ailment is a frequent cause of neurasthenia, especially in young women. They are ashamed of the obsessions or phobias from which they may be suffering and they endeavour to keep a smiling face in spite of attacks

of mental depression. The result is that they exhaust their powers of self-control and a condition of neurasthenia results. In such a case the discovery of tenderness and hardness of the colon gives a clue to the cause of their trouble, and sympathetic enquiry may induce them to reveal something as to the nature of their mental suffering. Sometimes these cases rapidly respond to treatment of the colon ailment, but if the neurasthenia be pronounced the over-excitability of the nervous system militates against the cessation of the abnormal muscular activity in the colon, and definite treatment for the neurasthenia will have to be combined with the treatment of the colon.

TREATMENT

The treatment of these patients with hard and tender colons is a very simple matter if the ailment be recognized in its early stages. All that is necessary is to give a mixture containing tincture of hyoseyamus in 20-minim doses, with 16 grains of salol made up with mucilage and chloroform water, three times daily, after meals, together with a diet from which salads, green vegetables, all uncooked fruit pulp and "roughage" in general is eliminated. One caution must, however, be given, namely, that some patients (owing, presumably, to faulty solubility of the duodenum) are not able to break up the salol into its constituent parts. Where, therefore, this mixture fails to relieve a patient, the giving of salol in tablet form may show, by the reappearance of the tablets in the stools, that the drug is not being dissolved. In such a case, some other antiseptic must be chosen or the free administration of alkalis may rectify the intestinal defect.

The relief given in cases of abdominal rigidity by this simple mixture containing hyoseyamus and salol is sometimes very striking in its rapidity and completeness. In July, 1929, I saw a lady, 40 years of age, who for half a year had been suffering from constipation.

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as "Colon dyspepsia" This term, however, cannot be satisfactorily applied to the large number of cases in which all the symptoms are mental, and there is no evidence of indigestion. In my book on the subject⁶ the term "Tonic hardening of the colon" was used, and possibly some such term as "Muscular hardening of the colon" might prove acceptable. It is, however, to be hoped that some new and better name will be found for this important ailment, for it is the cause of much suffering, both physical and mental, which might very easily be prevented by appropriate treatment

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Some Clinical Observations on Cancer

By W B COSENS, M R C S , L R C P

Late Honorary Consulting Surgeon to the Dorset County Hospital

I AM no expert on cancer research, just an observer in general practice for over forty years, but two special clinical facts have come under my observation. first, that an increased pulse-rate occurring with a cancerous growth, no matter the locality or size of the growth, is a symptom denoting a bad prognosis; secondly, a tender colon. The following record of two cases explains my points.—

By a strange coincidence, ten years ago, I saw in the same week two women, one aged 36 and the other 35. They both had growths in the upper and inner segment of the left breast, in both cases the growth did not exceed the size of a small tangerine orange. The elder woman had a pulse-rate of 86, the younger 72, the rate never varied in either. They both had tender pelvic colons. I did the complete operation in both cases. Friends naturally asked my opinion as to the future. In the case of the one with the pulse-rate of 86 I gave a very guarded prognosis. She died at the end of nine months with secondary deposits in her abdomen. The other case is alive and well to-day.

The second clinical fact I have noticed is that 85 per cent. of cancer cases have a slightly tender left pelvic colon. If I had the opportunity and the necessary skill, I should like to examine in the pathological laboratory, every colon of a person who had died from any form of cancer. The colon is the neglected cesspool of most individuals. Its contents eventually find their way on to the land or into the sea. Is there not a possibility that this method forms the carrier by which our food, animal world, fish, and ourselves become infected?

Some day the large intestine will receive as much

attention as the mouth. Uncleanly teeth or infected tonsils support a whole army of bacteria and organisms that are antagonistic to health, and there was at one time almost a craze to remove all teeth and both tonsils. My experience has been that sarcoma in children under ten years of age is most frequent in the jaw, in immediate connection with the lymphatics of the mouth. Everyone knows that the bottle-fed baby quickly reacts against decomposing food stuffs, the stomata in the mouth become inflamed and there is general constitutional disturbance.

Is it not within reason to suggest that food may contain an unknown and latent virus which finds a suitable developing ground in the vast alimentary tract of man and beast, and that the most easy area for absorption is in the mouth and large intestine? We know that the majority of human beings may be "carriers" of any virus, the disease clinically developing in the few.

The importance of mouth hygiene is recognized by all. I suggest that the importance of colon hygiene is overlooked. Aperients are useless for this purpose. Two pints of water when injected, are rapidly absorbed by the rectum and pelvic colon; the small intestine, with the exception of the duodenum, refuses to absorb all of its food contents, the colon seems capable of absorbing anything.

I have found in practice, in many cases of obscure ill-health, that if the colon is washed out on alternate days with two or three pints of iodine solution, $\frac{31}{100}$ to the pint, much of it is readily absorbed and eventually finds its way into the urinary bladder, thus ensuring the cleansing of the lymphatics of the intestine, the improved condition of the patient becomes obvious within two or three weeks, as evidenced in colour by a greater increase in hæmoglobin, and a feeling of greater well-being. This may be called Plombières treatment; I prefer the name

washing-out It can be done by the patient himself and requires no special armamentarium other than a douche-can and a few feet of rubber tubing

We should treat the colon with the same care that we do our teeth. Mouth and colon in effect represent the two ends of our alimentary tract, they are the recipients of crude material food The middle portion being selective takes care of itself The small intestine sorts out what is necessary for life The debris is collected in the large intestine where, if it is not soon evacuated, it undergoes rapid decomposition and lymphatic absorption. By habit we are inclined to give greater attention to the seen than we do to the unseen. Another common example of this dictum is in the comparative care of our hands and feet

There is nothing original in all this, I am simply voicing the idea that owing to modern conditions due to excess of population, there is an unknown pollution of food stuffs, as there used to be of water, or in their preparation, instanced in the case of rice and beri-beri The disease of cancer was known over two thousand years ago, the cause must have been the same then as now. What more likely than that the poison was conveyed by food and water? I suggest that it is by way of the large intestine that the cancer virus is absorbed, and that by a simple method of treatment the lymphatic absorption of the virus may be controlled.

Within another century all human and animal dead bodies will, I hope and believe, be cremated, application of manure to the land will be regulated, as a means of preventing infection to our water and food supplies.

Practical Notes

Laryngeal and Intestinal Tuberculosis.

Rubin reports that at the Montefiori Hospital, New York approximately half the patients with pulmonary tuberculosis have laryngeal tuberculosis and two-thirds intestinal tuberculosis. The incidence of laryngeal tuberculosis was equal in the two sexes, contrary to the general belief that it is two or three times commoner in males than in females. Laryngeal and intestinal tuberculosis co exist in 39 per cent of fatal chronic pulmonary tuberculosis, among 230 patients with laryngeal tuberculosis, intestinal ulceration was found in approximately 90 per cent at all ages, and 95 per cent in those patients under 30 years of age. Among 206 patients without laryngeal infection the intestines were affected in 17 per cent, and in patients with intestinal tuberculosis the larynx is attacked in 59 per cent, whereas, when the intestines are healthy, the larynx is affected in 14 per cent. Laryngeal tuberculosis is therefore four times as frequent in patients with tuberculous disease of the intestines as compared with those whose intestines are healthy. It is thought probable that the frequent association of laryngeal tuberculosis is not a mere coincidence but that, when the conditions of the body are favourable, organs of greater susceptibility are more apt to be affected. (*American Journal of Medical Sciences*, 1931, May, clxxxi, 663)

Tubercle Bacilli demonstrated by Gastric Lavage in Children

In children who as a rule swallow their sputum the diagnosis of pulmonary tuberculosis may be greatly assisted by microscopical examination of material obtained by gastric lavage, its cultivation on Petroff's medium and inoculation into guinea-pigs. Valdemar Poulson of Copenhagen, who advocates this procedure in otherwise obscure cases, reports five cases illustrating the value of the method and gives figures of its employment, in 48 cases, in children older than 3 years, tubercle bacilli were thus found in 12, and in 8 of these clinched the diagnosis. One examination of material obtained by gastric lavage is not sufficient, among 53 positive cases tubercle bacilli were found on the first examination in 38, on the second occasion in 12, on the third in two, and on the fourth in one. Expense can be diminished by performing gastric lavage on two successive mornings and mixing them before testing the whole amount—(*American Journal of Diseases of Children*, 1931, April, xli, 783)

Arvid Wallgren of Göteborg, Sweden, employs this method, first described by Meunier in 1898, to decide if children with erythema nodosum, a positive tuberculin test and hila shadows are excreting tubercle bacilli. During the past year he examined 40 children with erythema nodosum, 37 of these gave a positive tuberculin reaction, and of these, 17 showed tubercle bacilli.—(*Ibid*, 1931, xli, 816)

Bacillus Coli Infections of the Genital Tract.

L. Strominger, of Bucarest, reviews and reports cases of *Bacillus coli* infections of the prostate, urethra, epididymis, and uterus. The infection of the prostate may be the direct sequel of intestinal disorder or may be implanted on gonococcal infection, and may give rise to abscess formation. Such prostatic infection may, it is suggested, be responsible for vesical disorder in the patients' wives. Urethritis in like manner may be due to *Bacillus coli* infection as an original infection or subsequent to gonorrhœa, and the obstinate character of some gonococcal urethral cases may be due to such a combined infection. Epididymitis due to *Bacillus coli* infection is generally acute, with high fever and vesical symptoms, but sometimes it is so slow as to suggest tuberculosis, abscess formation may occur in this localization, which has been met with in babies. In women vaginal, uterine, and annexal infections with *Bacillus coli* are probably much more frequent than is generally recognized, because not often looked for bacteriologically, a vigorous reaction, improvement, and sometimes cure of the pelvic conditions in women, including hæmatoceles, after submucous or intramucous injections of a *Bacillus coli* vaccine is regarded as evidence in favour of this origin — (*Presse médicale*, Paris, 1931, June 6, 835)

The Problem of Infection in the Treatment of Prostatic Obstruction.

Hugh Cabot points out that when prostatectomy was introduced 35 years ago, the mortality was mainly due to renal insufficiency. This led to the enunciation of the principles of drainage and the development of various methods of studying kidney function, which resulted in a reasonably accurate estimate of renal capacity. In the period 1900 to 1915 these developments began to bear fruit and the mortality fell rapidly, chiefly perhaps, as the result of drainage, either urethral or suprapubic, but to a considerable degree from improvements in technique, even then renal insufficiency accounted for more than 30 per cent of the fatalities, and hæmorrhage for 20 per cent. In the last fifteen years as the result of further improvements in technique renal insufficiency, presenting the picture of nausea, vomiting, distension has fallen from first to at least the fourth place. At the present time the causes of death are in order of importance infection, including pyelonephritis, infection of the prevesical space, epididymitis and periurethritis, in the second place various forms of pneumonia, and then vascular lesions, pulmonary embolism and cerebral hæmorrhage. The attention paid to renal function has distracted attention from the prevention of infection. The infections with *Bacillus coli* rarely cause death, whereas those with *Proteus ammoniæ* are highly lethal. Catheter drainage is extremely prone to be followed by infection of the whole urinary tract, and unless this can be prevented by some discovery the position of one-stage prostatectomy is in jeopardy. Epididymitis, perhaps a more serious complication than has generally been recognized, can be avoided by division of the vas deferens at

the time that drainage is started —(*Proceedings of the Staff Meetings of the Mayo Clinic*, March 18, 1931, vi, 163)

Compression Fracture of the Spine.

S W Boorstein reports 49 cases of compression fracture of the spine, and sums up his conclusions as follows Every case of injury to the spine should be examined with extreme care to rule out fracture Immediate rest should be instituted until the examinations are complete If it does not endanger the patient, the roentgenogram should be made immediately, otherwise a delay of twenty-four hours to forty-eight hours may be deemed advisable Radiographs should be taken in two views, anteroposterior and lateral If doubt remains, stereoscope films should be taken as well If the roentgenogram is negative but the symptoms point to a fracture, another roentgenogram should be made in a few days, as it may then show the lesion. Diagnosis rests on history, localized pain and stiffness of the spine Fractures of the laminae, transverse and spinous processes, articular processes, the ribs, the bones of the extremities, especially the os calcis, are frequently present, complicate the prognosis and influence treatment Treatment Rest on Bradford frame, then plaster jacket or two plaster shells

The conservative treatment is attended by excellent results Full functional return may be expected after four to six months of recumbency and hyper-extension with the spine immobilized in a shell or jacket Early operation is indicated where the X-ray shows dislocated bone pressing upon the spinal canal Patients with fresh fractures should rarely be subjected to operative interference In cases of a complete transverse lesion of cord, operative interference can do no good In cases of incomplete lesion where there are indications for operation, it is more beneficial to wait two or three weeks Later nerve operations are indicated in cases of progressive symptoms and where adhesions are present All patients having injury in the cauda equina should be operated on, since the nerves of the cauda equina are capable of regeneration In late cases where pain still exists, nature has not ankylosed the injured region of the spine, and the patient is to return to strenuous back-bending labour, ankylosing operations should be considered They are likely to save time and allow the patient to labour without apprehension —(*American Journal of Surgery*, April, 1931, xii, 1, 43)

The Treatment of Fractures of the Axis

G Lucchese reports two cases of fractures of the axis vertebra, without symptoms involving the nervous system, in both of which cure was brought about through immobilization by means of plaster The author points out that cases of fracture of the axis are not so rare as might be imagined, and although fractures of the upper cervical region of the spine have a bad prognosis, the prognosis is not necessarily so bad as is usually supposed, provided that appropriate treatment is carried out promptly In one of the cases reported there was a fracture of the vertebral pedicles with dislocation forwards of the body of the axis, and in the other

case the odontoid process of the axis was fractured at its base with dislocation backwards of the odontoid process —(*Chirurgia degli Organi di Movimento*, January, 1931, xv, 481)

C Angelesco and G Buzoianu report a case of fracture of the axis without medullary symptoms, the fracture affecting the body and the base of the odontoid process. The authors point out that a fracture of the anterior arch of the axis is incomparably more serious than a fracture of the posterior arch, so long as the fracture is not accompanied by an occipito-atlas or atlo-axis dislocation. Treatment demands immediate and rigorous immobilization by means of plaster, and decompression is not indicated unless the fracture is accompanied by medullary symptoms of severe compression —(*Revue d'orthopédie*, May, 1931, xviii, 201)

Syphilitic Mesoartitis and its Treatment.

F Kisch contributes valuable clinical observations on 483 cases of luetic aortitis. The time of onset of mesoartitis after the initial infection was considerably and rather surprisingly different in those who received treatment early and in those who did not. In those who had received no treatment during the primary stage, clinical symptoms of aortitis did not develop until 23 years after infection, in those who received insufficient treatment, 27 years elapsed, whilst in those treated during the primary stage with salvarsan aortitis developed after an interval of 14 years. In uncomplicated cases of mesoartitis in which there is no aortic insufficiency or myocardial degeneration, a preliminary course of treatment with sodium iodide should be followed by treatment with salvarsan in small doses, preferably in conjunction with a digitalis preparation. Complicated aortic syphilis is not suitable for treatment by salvarsan. In these cases, it is safe to give digitalis and salyrgan, and later, digitalis with sodium iodide. The damaged myocardium is by this means often enabled to regain some degree of efficiency. Statistically Kisch found that by this method of treatment the time interval between the onset of cardiac insufficiency and death was lengthened more than by any other method —(*Klinische Wochenschrift*, June 13, 1931, 1117)

The Treatment of Peptic Ulcer.

E D Ahern discusses anatomical conditions and physiological disturbances bearing on the subject of peptic ulcer. He emphasizes the part played by associated abdominal conditions in the etiology of peptic ulcer, and particularly right-sided ptosis. The relationship to ptosis of disturbance of the sympathetic nervous system is discussed, but no definite conclusions are arrived at. The possibility of infection by the lymph stream from the terminal portion of the ileum, the appendix and the cæcum is also examined by the author in the light of recent work, and the theory that this is a probable cause of the condition is upheld by him. As regards treatment, the author lays most emphasis on the importance of a search for septic foci, and on the value of a properly performed gastro-enterostomy —(*Australian and New Zealand Journal of Surgery*, June, 1931, i, 52)

Reviews of Books

Abdominal Pain By JOHN MORLEY, Ch.M., F.R.C.S. With an Introduction by J S B STOFFORD, M.D., F.R.S. Edinburgh E and S Livingstone, 1931 Pp xv and 191 Figs 22 Price 10s 6d.

THIS is a book which everyone who wishes to gain a more accurate knowledge of the diagnostic significance of abdominal pain will do well not only to read, but to digest in a manner worthy of the way in which it is here presented. It is appropriate and significant of the times that a surgeon of Manchester should continue the researches, published in 1888 by James Ross, physician to the same hospital. This monograph, admirably introduced by the Professor of Anatomy in the University of Manchester, is the outcome of careful examination of the painful manifestations which are then correlated with the morbid conditions found at a subsequent laparotomy. Confining his attention to organic disease, Mr Morley has ingeniously obtained experimental evidence of value by the use of regional anaesthesia in human subjects, thus, infiltration with novocain of the painful cutaneous area in acute appendicitis and obstructive cholecystitis completely abolished the painful manifestations. The growth of knowledge of abdominal pain built up by Lennander, James Ross, Mackenzie, Head, Hurst, and Kappis, is critically presented, the explanation of a viscerosensory reflex put forward by James Mackenzie is shown to be unsatisfactory and good evidence is brought forward for the substitution of the author's theory of peritoneo-cutaneous radiation. Irritation of the parietal peritoneum, and not of the viscera, is the starting point, deep and superficial tenderness and muscular rigidity of the abdominal wall, so commonly seen in inflammatory conditions in the abdomen, are not in any way concerned with the afferent autonomic system, but are entirely referred from the highly sensitive cerebro spinal nerves of the parietal peritoneum, the mechanisms of peritoneo-cutaneous and peritoneo-muscular radiation are closely allied, and are put before the reader as a simpler and more satisfactory explanation of referred somatic pain than Mackenzie's theory of viscerosensory and visceromotor reflex.

The Diagnosis and Treatment of Brain Tumours By ERNEST SACHS, A.B., M.D. London Henry Kimpton, 1931 Pp 396 Figs 224 Price 42s

THE subject of this book is dealt with in a systematic manner for students, anatomy and physiology, methods of examination, pathology, symptoms, and diagnosis all receiving attention, while the ninth and last chapter is devoted to operative treatment. The author shows a natural and justifiable bias in favour of the work of his countrymen in this branch of surgery, but throughout he recognizes that of Europe in the field of neurology. There is little to arouse comment in the section devoted to anatomy and

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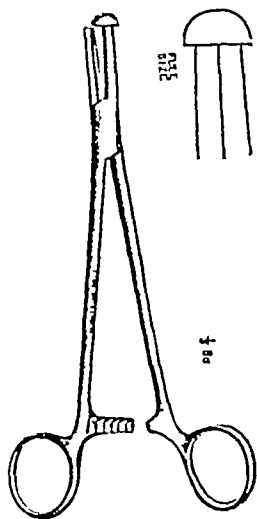
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Preparations and Inventions

PHRENIC EVULSION FORCEPS

(London Messrs Down Bros, Ltd, 21-23, St Thomas's Street, S E 1)

Mr Walter Mercer, F R C S E., writes —In performing the operation of phrenic evulsion the phrenic nerve is exposed in the neck under a local anæsthetic and grasped by fairly strong forceps. The nerve is then divided above the forceps and pulled slowly out from the chest cavity. The evulsion has to be very slowly proceeded with so that the nerve will be removed in as great a length as possible. If it is pulled out too strongly or too quickly the nerve may break. If this breakage occurs above the communicating branches which reach it below the clavicle, the diaphragm will still receive nerve impulses from these branches, so that the operation will be useless. By experience one finds that the best way of controlling this gradual pull on the nerve is to rotate the forceps and wind the nerve on to them very slowly. If ordinary forceps are used, the nerve slips off the end, since the forceps cannot be kept on the same plane as the nerve which lies at the bottom of the fairly deep wound. To overcome this minor difficulty, these forceps were produced. The round tip projects from the edges of the blade and so prevents the nerve from slipping over it. The blades themselves have longitudinal grooves, assuring a good grip of the nerve. The forceps should be of a fairly heavy type as this ensures a firmer and more complete control of the amount of force required.



HEUDEBERT'S BREADS AND CEREALS

(London Messrs Morel Bros, Cobbett & Son, Ltd, 22 and 24, Buckingham Palace Road, S W 1)

Messrs Morel Bros, Cobbett & Son announce that they have obtained an agency for the Heudebert breads and cereals, which are well known to most visitors to continental spas. These products are prepared in factories at Nanterre, Lyons and Brussels, and include dietetic breads (such as "essential bread," a bread without crumb prepared with soluble proteins as a basis, "spa breads," prepared to complete the diet of different spas, toasted bread, breads for the diabetic, and various biscuits), vegetable extracts, Heudebert soup, milk flour, prolamine and totus food, radiopaque and malt flour, cereal creams, soya flour, caffeine-free coffee, germinated barley, cocoa preparations, preparations for soups, gluten flours, etc. It is useful to have this wide range of well-tested preparations conveniently available for the medical profession in this country.

VOCAL-ZONE NASAL CAPSULES

(London Messrs Meggeson & Co, Ltd, New Church Street, Bermondsey, S E 16)

These nasal capsules of Messrs Meggeson form an ingenious method of applying oily drops to the nasal mucosa. The elongated end of a gelatine capsule is cut off, and the patient then throws his head well back or lies down and injects the contents well into the nostril by squeezing the capsule, the contents consist of menthol, carbolic, oil of pine and cinnamon in liquid paraffin, and are well calculated to be of value in the treatment of nasal catarrh, colds, laryngitis, hay fever, etc.

MOBILE X-RAYS

(London Messrs Mobile X-Ray and Diathermy Ltd, 13 Park Walk, Chelsea, S W 10)

The equipment of the Mobile X-Ray Co consists of X-Ray and diathermy apparatus conveniently accommodated in a motor-car, and the electric current necessary is obtained from a dynamo, mounted in front of the radiator, which can be linked up and driven by the engine of the car. X-Rays can therefore be taken in any house anywhere, independent of an electric supply, and the negative can be handed to the patient's practitioner within half an hour of the arrival of the mobile X-Ray unit. The negatives we saw were excellent, and the fees charged are very moderate.

OPENING OF NEW PREMISES OF MESSRS LEWIS

(London Messrs H K Lewis & Co, Ltd, 136, Gower Street, and 24, Gower Place, W C 1)

A representative gathering of members of the medical profession and scientists assembled on July 9th at the invitation of the directors of the company to a "house-warming" at the new premises at the well-known corner of Gower Street and Gower Place. Sir Gregory Foster, formerly Provost of University College and Vice-Chancellor of the University of London, presided during the more formal part of the proceedings, and Dr H R Kenwood, Emeritus Professor of Hygiene to the University, gave an interesting address on "Text-books and Education." Sir Gregory Foster referred to his long acquaintance with Messrs Lewis, which began as far back as 1881. He outlined the origin and development of the scheme which had resulted in the present building, and congratulated the directors on the realization of a large part of their efforts, and on their success in maintaining the high traditions for which the name of Lewis was noted throughout the world. He also congratulated University College on having at its doors an institution so helpful in their educational work. Professor Kenwood also referred to his long association with Lewis's, as student, teacher and author. Mr H L Jackson, the present chairman of the company, and a nephew of Mr H K Lewis, the founder, said that after 87 years of steady growth and some earlier extensions they were at last housed in a suitable and becoming building, including accommodation for authors, editors, publishers, printers and booksellers, and users of books.

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The Value of Post-Graduate Medical Education

By SIR HENRY SIMSON, K C V O, M B, F R C P,
F R C S E, F C O G

*Dean of the West London Post-Graduate College, Obstetric Surgeon
to the West London Hospital, Consulting Surgeon to the Hospital
for Women, Soho Square*

WHEN anybody wishes to enter a profession, be it Medicine, the Law, the Army, the Navy or the Church, it is necessary for such a person to pass certain examinations and so qualify himself to practise that profession; but no one will aver that the mere passing of an examination can guarantee that a person having done so is really capable of practising that profession. It is also a well-recognized principle that any advances made in a profession are usually accompanied by a further enquiry into the knowledge possessed by anyone who wishes to make such an advance. Take the Army as an example; at each step for promotion courses of special studies and examinations have to be undertaken and passed, and I make bold to say that in no profession more than in the medical profession is post-graduate study more necessary in order that practitioners may keep abreast of the advances which are constantly being made in the methods of treating disease.

There are several methods by which post-graduate

education can be obtained: First, a very old and very practical one is that a young practitioner should become an assistant to or go into partnership with an older man and by practical experience in a busy general practice learn how to put into effect the knowledge he has gained during his years of undergraduate study. Another well-established method is for a young practitioner, immediately after qualifying, to obtain a post as house-physician or house-surgeon in a hospital. These posts are held for six months or a year, and the amount of experience gained in this short time is probably greater than would be gained in five or six years of an assistantship in general practice. There are very obvious disadvantages in both of these methods: only a limited number of picked undergraduates are successful in obtaining house appointments, and the knowledge gained by an assistant entirely depends upon the experience of his senior partner.

There are, however, some other methods of much greater importance. the first has been for many years well recognized on the Continent and particularly in Vienna. The post-graduate school at Vienna has a great reputation and attracts medical practitioners from every part of the world to a large hospital of over a thousand beds, with all the leading physicians and surgeons of Vienna on its staff.

After the passing of the important National Health Insurance Act twenty years ago, a large number of medical men and women became panel practitioners. Within recent years the Ministry of Health came to the conclusion that some form of post-graduate study was necessary in order that the medical service supplied under the Insurance Act should be effective, and when Mr Neville Chamberlain was Minister of Health an influential committee was appointed to advise the Ministry on the question of post-graduate education. This committee has made certain recommendations,

and it is quite clear from these recommendations that the ideal which this committee has in view is that which has been found so successful in Vienna. I have no hesitation in saying that this method holds out possibilities which could not be obtained in any other way. A great Imperial Post-Graduate College, situated in London and staffed by the leading men in the profession, equipped with laboratories for research and giving facilities for original work, is an inspiring ideal, and I am glad to say that such a hospital will soon come into being.

There are, of course, still difficulties to be overcome; no great scheme can ever come into being without having difficulties to overcome. Not only will a very large sum of money be necessary, but a representative medical and surgical staff will have to be found, and here London presents a difficulty quite of its own, inasmuch as there are a large number of famous undergraduate hospitals which always will attract their own most brilliant students. Once, however, an "Imperial Post-Graduate Hospital" becomes an established fact it will certainly draw to it the best brains in the country.

In an enormous centre such as London, there is always a very large amount of clinical material available for post-graduate education; but it is difficult for any practitioner coming to London to make the best use of this material, as it is widely scattered about over such a large area. In order to meet this difficulty, the Fellowship of Medicine was started just after the War, with a central office, which is housed at present in the premises of the Royal Society of Medicine at the end of Wimpole Street. The Fellowship is undoubtedly doing very valuable work, its indefatigable secretaries are in touch with all the hospitals in London, and throughout the year special intensive courses are arranged in these hospitals. Any practitioner who wishes to come up to London for a course

of post-graduate study has simply to write to the secretary of the Fellowship, stating particulars of the course of study he wishes to pursue and the time he wishes to be in London, and the secretary is able to send him details of whatever courses are available. Taken as a whole, this method of post-graduate education has proved of great value, but it suffers from the fact that it cannot supply all its facilities under one roof.

Post-graduate education from the general practitioner's point of view is quite distinct from that of the newly-qualified practitioner who, finding that he has received only rudimentary instruction during his undergraduate career, wishes to increase his practical knowledge by spending six months or a year at some large post-graduate centre, such as Vienna. It is also different from the needs of the practitioner who has been for some years in practice and has perhaps been appointed to the staff of his local hospital, and wishes to increase his knowledge in some special branch of medicine or surgery.

What the great majority of general practitioners want is a place where they can go and see and examine a large number of cases of every kind of disease in a short time. There are certain difficulties standing in their way. First of all, the general public in this country have not been educated up to recognize the value of post-graduate education. There are still a great many of people who will say that Doctor Jones is a really good doctor because he has been in the hospital. In America, the public are quite alive to the value of post-graduate study for medical education. In the United States, there are several hundred post-graduate societies, and every year two or three hundred of these societies come over to make a tour of important medical centres on the other side of the Atlantic. In

conversation with these practitioners, one has been told that the attitude of mind of their patients is that unless a medical man takes advantage of one of these tours every now and then, his reputation as a live and progressive man is certain to suffer. Public opinion in this country certainly requires education on this important point.

Another difficulty arises out of the fact that a general practitioner experiences some difficulty in finding time for post-graduate study. The necessarily uncertain nature of his professional engagements makes it difficult for him to be certain of being able to get away at any particular time, confinements have to be booked several months ahead, a bad case of pneumonia may hold him up, and there is also the expense to be considered. Unless he happens to be in a partnership, the practitioner has to pay a locum tenens while he is away, and there are also the incidental expenses associated with living away from home. The average general practitioner, not being a rich man, has generally to decide, therefore, whether he should curtail a hard-earned holiday by spending a fortnight of it in post-graduate study, and, human nature being what it is, golf clubs or a fishing rod generally gains the day.

Looking at post-graduate study from the point of view of the Ministry of Health, as one of the chief duties of the Ministry is to provide an efficient medical service under the National Insurance Act, there can be no doubt that the efficiency of this service would be increased if arrangements could be made for every doctor working under the Act to be given an opportunity every two or three years, free of expenses, of having a fortnight's post-graduate course in a general hospital. As an illustration, I may quote the experience of a well-known life insurance company. A good many years ago now this company found that it was making large profits, and the directors discussed how these

profits could be best used. The first thing which they went into was whether they could reduce their premiums, they asked their actuary to go into the matter, but were told that if they reduced these premiums by any appreciable amount the profits would practically disappear. An alternative suggestion was accordingly adopted, namely that the benefits should be increased by supplying a trained nurse for the first fortnight of an acute illness, and in addition all their clients were given the opportunity of being overhauled by one of the company's doctors twice a year. As a result their liabilities at once decreased and their profits increased even more.

What is really wanted to meet the needs of the general practitioner and the Ministry of Health is a general hospital of 200 or 300 beds with daily operations and large out-patient and casualty departments situated in an accessible part of London. Of course, practically any of the large undergraduate teaching hospitals in London would fill this need, were it not for the fact that it is quite impossible to combine post-graduate teaching with undergraduate teaching. Undergraduates need lectures and elementary instruction in diagnosis. The last thing a post-graduate wants is a lecture, and discussions on prognosis and treatment are of far greater value than the, to him, comparatively simple matter of diagnosis.

Post-Graduate Education in London

By R. SCOTT STEVENSON, M.D., F.R.C.S.E.

POST-GRADUATE medical education in London has taken a great stride forward during the past year on the acceptance by the Government of the recommendation by a special committee (appointed by Mr. Neville Chamberlain in 1925) that a British Post-Graduate Hospital and Medical School should be established at the Hammersmith Hospital, Ducane Road, Shepherd's Bush, a modern hospital of 400 beds, formerly under the Poor Law authorities, and now under the control of the London County Council. The Government is to grant the sum of £250,000 from public funds to build and equip the medical school to be associated with the hospital, and is to make provision for grants through the University of London towards the maintenance of the medical school on lines already applied to comparable institutions of university rank. The Minister of Health, after consultation with the London County Council and the Senate of the University of London, has appointed a Provisional Organization Committee to consider and report upon the action requisite to lead up to the planning and construction of the medical school, and upon the form of government appropriate to the hospital and medical school, with special reference to the position of the London County Council as the local authority responsible for the hospital, and to the position of the University of London in relation to the medical school.

The chairman of this committee is Viscount Chelmsford; the Ministry of Health is represented by Sir George Newman, chief medical officer, and Mr M. Heseltine, an assistant secretary; the London County

Council by Dr. Florence Barrie Lambert, Sir William Ray, Mr. Angus N. Scott, and Mr. L. Silkin; and the University of London by the Rev. Dr. Scott Lidgett, vice-chancellor-elect, Mr. Sidney L. Loney, chairman of convocation and deputy chairman of the court, Mr. H. L. Eason, superintendent and senior ophthalmic surgeon, Guy's Hospital, and Dr. Edwin Deller, principal of the university. The other members of the committee (all of them members of the medical profession) are: Mr. Donald J. Armour, senior surgeon, West London Hospital, Lady Barrett, Dean of London (Royal Free Hospital) School of Medicine for Women; Mr. Comyns Berkeley, consulting surgeon to the Middlesex Hospital; Sir Robert Bolam, honorary physician to the Skin Department, Royal Victoria Infirmary, Newcastle-on-Tyne, and past Chairman of Council, British Medical Association; Dr. H. B. Brackenbury, Chairman of Council, British Medical Association; Dr. H. G. Dann, chairman of Insurance Acts Committee of the British Medical Association; Lord Dawson of Penn, Physician-in-Ordinary to the King, and extra physician to the London Hospital, Dr. H. R. Dean, professor of pathology, Cambridge University, Sir Walter Morley Fletcher, secretary of the Medical Research Council; Mr. G. E. Gask, professor of surgery, London University, and surgeon to St. Bartholomew's Hospital, Sir Thomas Horder, Bart, Physician-in-Ordinary to the Prince of Wales, and physician to St. Bartholomew's Hospital; Dr. F. N. Kay Menzies, medical officer of health for the County of London; Lord Moynihan of Leeds, President of the Royal College of Surgeons of England, consulting surgeon to Leeds General Infirmary; Mr. H. J. Paterson, senior surgeon, London Temperance Hospital, and honorary secretary of the Fellowship of Medicine and Post-Graduate Association, Dr. Harold Pritchard, senior physician to the West London Hospital; and Sir Holburt Waring, senior surgeon to St. Bartholo-

mew's Hospital. Mr. Heseltine is the secretary, and all communications on the business of the committee should be addressed to him at the Ministry of Health, Whitehall, S W 1.

The first step towards organizing the hospital has been the appointment of a superintendent, bearing in mind the functions he will have to assume with the development of the hospital in association with the post-graduate medical school. The excellent choice has been made of Sir Thomas Carey Evans, F R C S, who has had the advantages of education at both a provincial and a metropolitan medical school, service in the Indian Medical Service and experience of consulting practice in London, and who in a very high position in India disclaimed the suggestion that his appointment was a lucky one by the display of great administrative ability.

It has been said by some critics that the Post-Graduate Hospital at Shepherd's Bush is inconveniently situated; but what is really meant is that its situation is an unfamiliar one, for it is much nearer to the centre of London than, for instance, the Medical Centre is to the centre of New York, and it is as easily reached as the Prince of Wales's Hospital, Tottenham, or the Miller Hospital, Greenwich, both of which have very successful post-graduate courses associated with them. In addition, a residential hostel in a convenient situation is to be provided for the post-graduate students of the hospital. In the near future, therefore, it should be no longer possible to read, in a journal so friendly to British medicine as the *Medical Journal of Australia*, the following editorial comment¹ —

“Graduates desirous of undergoing courses of training in special branches of medical science have found that they can best obtain the kind of training they seek in European centres or in the United States of America. In such cities as Vienna, Berlin, Paris and New York adequate provision is made for post-graduate students

In Great Britain the same satisfactory arrangements have not existed. . . This state of affairs is to be deplored, as the standard of British medicine is certainly equal to that of any other country."

As a matter of fact, even to-day the medical post-graduate facilities in London are very much better than has sometimes been suggested. The Fellowship of Medicine and Post-Graduate Association, which is associated with some fifty London general and special hospitals, has been in existence for a good many years, and its officials from their wide experience are able to give information not only about the available post-graduate courses in London, but about living accommodation, how best to get from hotel or rooms to the hospitals the post-graduate student is working at, and also about post-graduate courses at foreign centres. It is unfortunate that all the hospitals in London to which post-graduates are admitted are not associated with the Fellowship of Medicine, and, indeed, some have recently withdrawn from it. It is advisable, therefore, for an intending post-graduate student not to buy the comprehensive ticket of the Fellowship until he has ascertained whether the hospital at which he hopes to work is included in its scope. The address of the Fellowship of Medicine is Room 28, Royal Society of Medicine, 1 Wimpole Street, London, W.1. The work and the usefulness of the Fellowship of Medicine should by no means be at an end when the new Hammersmith Post-Graduate Hospital and Medical School is in full working order. Many post-graduates coming to London will find their special needs perhaps even better met at some of the post-graduate courses at other hospitals, for all post-graduates do not want the same sort of instruction and experience. Some are preparing for higher diplomas or for an examination for promotion in one of the services, others are general practitioners desirous of refresher courses to bring their general knowledge up

to date or of adding the knowledge of some special subject to their general work. The following courses have been arranged by the Fellowship of Medicine up to the end of the present year, and a detailed syllabus of each course is obtainable at the office of the Fellowship :—

- DISEASES OF THE CHEST (Sept 7 to Sept 12) —Brompton Hospital
All day Fee £3 3s
- PSYCHOLOGICAL MEDICINE (Sept 8 to Oct 3) —Bethlem Royal
Hospital Tues and Sat 11 a m Fee £1 1s
- DISEASES OF INFANTS (Sept 14 to Sept 26) —Infants' Hospital
Afternoons Fee £3 3s
- OPHTHALMOLOGY (Sept 14 to Oct 10) —Central London Ophthalmic
Hospital Afternoons Fee £3 3s
- MEDICINE, SURGERY & THE SPECIALITIES (Sept 14 to Sept 26)
—Westminster Hospital All day Fee £5 5s (Men only)
- MEDICINE, SURGERY & THE SPECIALITIES (Sept 28 to Oct 10) —
Metropolitan Hospital All day Fee £3 3s
- M.R.C.P. EVENING COURSE (Oct 13 to Dec 4) —London Medical
Society Lecture Room Tuesdays and Fridays, 8 30 p m Fee
£6 6s for Course, or 10s 6d per Lecture
- F.R.C.S. (FINAL) EVENING COURSE (Oct to Nov) —One evening
weekly for six weeks Dates, time, place and fee to be fixed later
(Limited to 24.)
- DISEASES OF THE EAR, NOSE AND THROAT (Oct 5 to Oct 31) —
Central London Throat, Nose and Ear Hospital All day Fee
£5 5s (Operative Class, £7 7s, Peroral, £6 6s, Pathology,
£5 5s all strictly limited)
- TROPICAL MEDICINE (Oct 5 to Oct 24) —Hospital for Tropical
Diseases All day Fee £8 8s
- DERMATOLOGY (Oct 12 to Nov 7) —St John's Hospital Afternoons
Fee £1 1s (Practical Pathology arranged Fee £4 4s)
- CARDIOLOGY (Oct 12 to Oct 24) —National Hospital for Diseases
of the Heart All day Fee £7 7s (Limited to 20)
- GYNÆCOLOGY (Oct 12 to Oct 24) —Chelsea Hospital for Women.
Mornings and/or afternoons Fee £5 5s
- DISEASES OF CHILDREN (Oct 19 to Oct 31) —Hospital for Sick
Children. Mornings Fee £5 5s (Minimum of 12)
- MEDICINE, SURGERY AND GYNÆCOLOGY (Nov 2 to Nov 21) —Royal
Waterloo Hospital Afternoons and some mornings Fee £3 3s.
- NEUROLOGY (Nov 2 to Nov 28) —West End Hospital for Nervous
Diseases Daily 5 0 p m Fee £2 2s (Minimum of 10)
- OPHTHALMOLOGY (Nov 9 to Nov 28) —Royal Westminster
Ophthalmic Hospital Afternoons Fee £4 4s
- DISEASES OF THE CHEST (Nov 16 to Nov 28) —Victoria Park Hos-
pital. All day Fee £2 2s
- VENEREAL DISEASES (Nov 16 to Dec 12) —London Lock Hospital.
Afternoons and evenings Fee £2 2s
- PROCTOLOGY (Nov 23 to Nov 28) —St Mark's Hospital All day.
Fee £3 3s.

DISEASES OF INFANTS (Nov 30 to Dec 12) —Infants' Hospital
Afternoons Fee £3 3s
DERMATOLOGY (Nov 30 to Dec 12) —Blackfriars Skin Hospital
Afternoons Fee £1 1s

In addition to these there are during the year special post-graduate courses on radium therapy at the Radium Institute and Mount Vernon Hospital, the Cancer Hospital, the Westminster and some other of the general hospitals, on obstetrics at Queen Charlotte's and the London Maternity Hospital; on fevers at the various fever hospitals under the London County Council, on nervous diseases at the Tavistock Clinic, and on physiology and bio-chemistry at University College

Special courses for both parts of the examination for the F R C S are held at most of the undergraduate hospitals, but they may be attended by post-graduates; there is also teaching for this diploma at the Seamen's Hospital, Greenwich For the M R C P., courses lasting six weeks are held at the London, Guy's, and King's College Hospitals In order to meet the demands of practitioners unable to attend these all-day courses, the Fellowship of Medicine arranges a bi-annual series of lectures for the M R C P These are bi-weekly at 8 30 p m, the course lasting eight weeks, with first-class lecturers, but of course they do not pretend to cover the whole ground necessary There is also an evening F R C S course, once weekly for six weeks, designed as a final revision course

The following are the arrangements for teaching for the other diplomas, all courses for these special diplomas are open also to those who are not preparing for the examinations and are therefore useful for post-graduates interested in the various special subjects D L O —The Central London Throat, Nose and Ear Hospital holds twice a year a course of three weeks' duration, which includes clinical work, a practical operative class, and classes on peroral endoscopy and pathology The regulations for the diploma demand

one year of special study of diseases of the ear, nose and throat, and the Hospital for Diseases of the Throat, Nose and Ear, Golden Square, and the Metropolitan Ear, Nose and Throat Hospital, Fitzroy Square, are also recognized for this purpose D P M — The Maudsley Hospital holds a course in two parts, each part lasting three months, and the Bethlem Hospital, now at Eden Park, Beckenham, gives two courses a year, of three months' duration Three courses annually are organized in neurology by the National Hospital, Queen Square, each lasting eight weeks, and fulfilling the requirements for this diploma D T M — The London School of Hygiene and Tropical Medicine arranges two courses annually, each lasting for five months D P H — The London School of Hygiene and Tropical Medicine (University of London) and the Royal Institute of Public Health, Russell Square, provide facilities for this, the course covering a period of twelve months D O M S — In order to sit for this examination, candidates must have attended the clinical practice of a recognized ophthalmic hospital, or the ophthalmic department of a general hospital, for at least twelve months The five ophthalmic hospitals in London are all recognized hospitals for this purpose the Royal London Ophthalmic Hospital, the Royal Westminster Ophthalmic Hospital, the Central London Ophthalmic Hospital, the Royal Eye Hospital, and the Western Ophthalmic Hospital. D M R E — Courses are held once a year, in October, at one of the medical schools Particulars may be had from the secretary, British Institute of Radiology, 32 Welbeck Street, London, W 1 D G O — The new Diploma in Gynæcology and Obstetrics is open to practitioners who have been qualified for not less than three years, and candidates must have been attached as a resident officer or clinical assistant to a recognized general hospital or maternity hospital The regulations may be obtained from the secretary, Examination

followed by cure of the condition.

By suppurative pneumonitis is meant a condition in which the parenchyma of the lung is infiltrated with pus, but has not disintegrated, such an area has the potentiality of recovery and is found at the periphery of abscesses and around bronchiectatic dilatations.

Next in order of frequency in the etiology of abscess is an operation performed under general anæsthesia, particularly operations on the upper respiratory passages. There is considerable controversy as to the route of infection in these cases; we favour the view that it takes place by way of the air passages, while others contend that the infection is *via* the blood stream.

Foreign bodies aspirated into the bronchi may give rise to abscess formation; this factor is more common in America than in this country, but the possibility of this as causation of an abscess must always be kept in mind, for in such case the first therapeutic measure to be contemplated is its removal. Bronchial obstruction, from whatever cause, neoplasm, gummatous stenosis, pressure from without (*e g* aneurysm), will cause suppuration to take place in the lung parenchyma and bronchial walls behind the obstruction. The most common form of obstruction in the present day is new growth of the bronchus.

Trauma to the chest and drowning with recovery are other occasional causes of lung abscess.

SYMPTOMATOLOGY OF LUNG ABSCESS AND BRONCHIECTASIS

In lung abscess, the history is generally as follows. An acute respiratory illness (perhaps following operation) is followed by fever, pain in chest, and cough. The cough is at first dry, later purulent sputum is expectorated, usually in association with slight hæmoptoe. It is the occurrence of this purulent sputum the chief point in the diagnosis of the

one year of special study of diseases of the ear, nose and throat, and the Hospital for Diseases of the Throat, Nose and Ear, Golden Square, and the Metropolitan Ear, Nose and Throat Hospital, Fitzroy Square, are also recognized for this purpose. D P M — The Maudsley Hospital holds a course in two parts, each part lasting three months, and the Bethlem Hospital, now at Eden Park, Beckenham, gives two courses a year, of three months' duration. Three courses annually are organized in neurology by the National Hospital, Queen Square, each lasting eight weeks, and fulfilling the requirements for this diploma. D T M — The London School of Hygiene and Tropical Medicine arranges two courses annually, each lasting for five months. D P H — The London School of Hygiene and Tropical Medicine (University of London) and the Royal Institute of Public Health, Russell Square, provide facilities for this, the course covering a period of twelve months. D.O M.S — In order to sit for this examination, candidates must have attended the clinical practice of a recognized ophthalmic hospital, or the ophthalmic department of a general hospital, for at least twelve months. The five ophthalmic hospitals in London are all recognized hospitals for this purpose: the Royal London Ophthalmic Hospital, the Royal Westminster Ophthalmic Hospital, the Central London Ophthalmic Hospital, the Royal Eye Hospital, and the Western Ophthalmic Hospital. D M R E — Courses are held once a year, in October, at one of the medical schools. Particulars may be had from the secretary, British Institute of Radiology, 32 Welbeck Street, London, W 1. D.G.O — The new Diploma in Gynæcology and Obstetrics is open to practitioners who have been qualified for not less than three years, and candidates must have been attached as a resident officer or clinical assistant to a recognized general hospital or maternity hospital. The regulations may be obtained from the secretary, Examination

Hall, Queen Square, W C 1

The West London Hospital, Hammersmith (not now to be confused with the Hammersmith Post-Graduate Hospital at Ducane Road, Shepherd's Bush), and the Prince of Wales's General Hospital, Tottenham, have had post-graduate colleges attached to them for many years, which, in spite of many difficulties, have done excellent work, the West London Hospital is at present engaged on a scheme for rebuilding and extending its post-graduate college. The dean of the West London Post-Graduate College is Sir Henry Sumson, K.C.V O, and the dean of the North-East London Post-Graduate College is Dr T H. C Benians. The Hospital for Nervous Diseases, Queen Square, has gained a reputation as one of the best teaching institutions in London, and at its out-patient demonstrations, on five afternoons a week, fifty or sixty post-graduate students from all over the world are often present; these demonstrations are supplemented by courses of lectures on pathology, etc. Some of the twelve hospitals with undergraduate medical schools (such as the Westminster Hospital, noted in the list given above) hold post-graduate courses, designed as refresher courses, during the vacations, and old students of the hospital will find themselves particularly welcome there. At Guy's Hospital, Dr. Arthur Hurst has a famous weekly demonstration open to all post-graduates, at St Bartholomew's Hospital Professor F R Fraser's round is open to post-graduates by invitation; and at St. George's Hospital there is a weekly demonstration in neurology open to post-graduates, Dr. James Collier alternating with Dr. Anthony Feiling.

Reference.

Leading article *Medical Journal of Australia*, January 10, 1931,

The Treatment of Pulmonary Suppuration

By A J SCOTT PINCHIN, M D , F.R.C.P

Physician to the City of London Hospital for Diseases of the Heart and Lungs, Victoria Park, and to the West London and Hampstead General Hospitals,

AND H V MORLOCK, M O , M D , M R C P

Physician to Out-Patients at the City of London Hospital for Diseases of the Heart and Lungs, Victoria Park, and the Miller and Hampstead General Hospitals

PULMONARY suppuration, including under this general term suppurative conditions affecting the trachea, large and small bronchi, and parenchyma of lung, often presents extremely difficult problems as regards diagnosis and treatment, and calls for a great nicety of judgment in order that the best may be done for the patient, allowing the natural recuperative powers a chance, whilst endeavouring to help by the medical means at our disposal; yet not delaying surgical procedures until a time when the patient is so toxic that he is unable to stand an operation

Despite the great advances recently made in chest surgery, it must always labour under the disadvantage of having to deal with a closed and more or less rigid cavity, which the most extensive plastic operations cannot completely obliterate, and though in non-suppurative conditions lobectomy is followed by sufficient expansion of the remaining lobe or lobes to fill the space, it is rarely in suppurative conditions that the pleura or other lobes are sufficiently unimpaired to allow this to take place. Moreover, nature not only dislikes the space left vacant by removal of organs from the chest, but also has an antipathy to foreign bodies introduced to take their place, so that pneumolysis and even air or gomenol oil may be followed by

suppuration and extrusion.

With the limitations of surgical methods in our minds, it is well to exploit all the more conservative methods of treatment, with careful observation of the progress of the patient before we resort to operative measures.

The conditions to be considered here are (1) Purulent tracheitis and bronchitis. (2) Bronchiectasis of all grades. (3) Suppurative pneumonitis. (4) Lung abscess (5) Gangrene.

Although this article deals mainly with treatment, inasmuch as this varies with the condition present, a brief reference must be made to the etiology and differential diagnosis and, of even more importance, to the type of suppuration and its localization.

ETIOLOGY

Suppurative tracheitis and bronchitis—The line of demarcation between an acute inflammation and suppuration is fine, and it is extraordinary that infections lead comparatively seldom to this condition, probably this is due to the strong ciliary action of the bronchial mucosa. Influenzal infections characterized by intense inflammation of the tracheal and bronchial mucous membranes, though frequently followed by pneumonia, are much less often followed by suppuration in the trachea, bronchi or lungs. Occasionally a residual infection may light up, on three occasions we have seen pure pneumococcal unaerated pus spat up in large quantity after an operation, simulating the spitting up of an empyema—none of the cases had any physical signs except of bronchitis of large tubes, and in every case the condition ceased in a day or two. If the condition does not clear, the suppuration damages the mucosa, the ciliary action does not take place, the tubes become infected and dilated, and bronchiectasis follows.

Bronchiectasis.—It would appear that the common

cause of an acquired unilateral bronchiectasis is damage to the bronchial wall by an acute pneumonia or broncho-pneumonia, occasionally it may be secondary to inhalation of foreign body, though we are not in agreement with Chevalier Jackson that the majority of unilateral cases are due to this cause

In bilateral bronchiectasis the condition may start with a basal broncho-pneumonia or bronchiolitis. Such a condition is not uncommonly seen in young people with slight signs of dilatation at both bases, often with a history of recurrent attacks of pneumonia, and in whom often a pure culture of an infecting organism may be found. The chronic infection leads to dilatation, the mucous membrane of the bronchial passages becomes turgid above the inflammation and prevents the free outlet of the secretions, with the result that we get the circular grape-like dilatations behind the obstruction (an important point in treatment); loss of cough reflex in this area and secondary infection usually complete the picture. Again the sequence may be tracheitis, bronchitis, bronchiolitis, or dilatation, secondary to septic foci in the upper respiratory tract, teeth, tonsils, sinuses and post-nasal fossæ

Lung abscess—The commonest cause of lung abscesses is an acute respiratory infection. It is impossible to say if this is a pneumonic condition which progresses to a suppurative pneumonitis, and so to abscess formation, or if from the first it is a suppurative pneumonitis; in necropsies of patients dead of influenzal pneumonia it is not uncommon to see the process of suppuration commencing in some part of the lung. Probably the condition is not uncommon in influenza as a suppurative pneumonitis; not infrequently after an attack of influenza, which may be comparatively mild but with much cough, about the seventh to tenth day, after a slight hæmoptysis, a small amount of offensive sputum is expectorated,

followed by cure of the condition

By suppurative pneumonitis is meant a condition in which the parenchyma of the lung is infiltrated with pus, but has not disintegrated; such an area has the potentiality of recovery and is found at the periphery of abscesses and around bronchiectatic dilatations

Next in order of frequency in the etiology of abscess is an operation performed under general anæsthesia, particularly operations on the upper respiratory passages. There is considerable controversy as to the route of infection in these cases; we favour the view that it takes place by way of the air passages, while others contend that the infection is *via* the blood stream

Foreign bodies aspirated into the bronchi may give rise to abscess formation, this factor is more common in America than in this country, but the possibility of this as causation of an abscess must always be kept in mind, for in such case the first therapeutic measure to be contemplated is its removal. Bronchial obstruction, from whatever cause, neoplasm, gummatous stenosis, pressure from without (*e.g.* aneurysm), will cause suppuration to take place in the lung parenchyma and bronchial walls behind the obstruction. The most common form of obstruction in the present day is new growth of the bronchus

Trauma to the chest and drowning with recovery are other occasional causes of lung abscess

SYMPTOMATOLOGY OF LUNG ABSCESS AND BRONCHIECTASIS

In lung abscess, the history is generally as follows: An acute respiratory illness (perhaps following operation) is followed by fever, pain in chest, and cough. The cough is at first dry, later purulent sputum is expectorated, usually in association with slight hæmoptysis. It is the occurrence of this purulent sputum which is the chief point in the diagnosis of the

condition The sputum when first raised may be very offensive and considerable in amount, on the other hand, neither the odour nor the amount may be striking. Therefore, in considering the diagnosis of an obscure respiratory illness, the possibility of foul sputum having been raised must be inquired into, for it is not always present at the time of examination, and the history of its occurrence is seldom given spontaneously.

Differential diagnosis—There are no physical signs diagnostic of lung abscess; they are usually those of consolidation, occasionally of cavitation, and not uncommonly those of pleural involvement or serous or purulent effusion. The condition may be confounded with tuberculosis, but a tuberculous lesion breaking down to the extent of causing purulent sputum is almost certain to contain tubercle bacilli.

Neoplasm of lung If a growth has caused suppuration behind an obstructed bronchus, the condition, being an abscess plus a new growth, can only be differentiated by bronchoscopic examination, occasionally by lipiodol injection, or the appearance of metastases.

Gumma Wassermann reaction and examination of sputum. *Interlobar empyema* The physical signs will be present in the region of an interlobar septum, and radiological examination is of value. *Bronchiectasis*

This is distinguished by its long history (for the most part apyrexial, accompanied often by periods of high temperature when the sputum is retained), the absence of leucocytosis, by lipiodol injection and bronchoscopic examination.

The diagnosis of pulmonary suppuration having been made, the next step toward treatment is to determine the type of suppuration to be dealt with, as the treatment will vary according to the type.

Bronchi

- | | |
|--|--------------------------------------|
| 1 Suppurative tracheitis and
bronchitis | 3 Apical bronchiectasis |
| 2 Dry bronchiectasis and
bronchiectasis | 4 Early basal bronchiectasis |
| | 5 Advanced basal bronchiec-
tasis |

Lungs (Ballon)

- | | |
|-------------------------------|-------------------------|
| 1 Single abscess | 4 Multiple abscess |
| 2 Bronchiectatic abscess | 5 Secondary to neoplasm |
| 3 Abscess with bronchiectasis | 6 Tuberculosis |

One is able to determine the type of suppuration with which one is dealing by lipiodol injection of the bronchial tree, bronchoscopic examination and a bronchoscopic pneumogram. By these means also the lesion must be localised. Antero-posterior and lateral views must be taken radiologically both before and after lipiodol.

It may happen in bronchiectasis, and is usual in abscess, that the inflammatory condition of the passages does not allow the entrance of the lipiodol, in these cases the bronchoscopic pneumogram is invaluable.

H M developed a lung abscess twelve months ago at the right base. Lipiodol failed to reveal the exact site. Medical treatment was carried out for two months, and the patient was well, but had occasional hæmoptyses. He then had a large hæmoptysis, and the surgeon was asked to open the abscess, a two-stage operation failed to locate the abscess, and the hæmorrhages recurred later. A phrenic evulsion was then done with a good rise of diaphragm. The patient was much better, and was sent to Torquay, where he had a severe hæmorrhage. He was taken in again, and an artificial pneumothorax was done, with good collapse of the whole of the upper part of the lung, but the hæmorrhages recurred. We then examined him with a bronchoscope, and found a posterior branch of the lower lobe bronchus with a congested opening and exuding pus. A sound was passed down this, and lipiodol injected, and the lateral view now shows a cavity outlined with lipiodol in the lower posterior part of the lung.

(1) *Suppurative bronchitis and tracheitis*—The bronchoscope renders the treatment of the bronchial mucous membrane as practicable as the more accessible mucous membranes. Drainage, introduction of antiseptic oily solutions (such as 10 per cent gomenol) or rubbing with antiseptics will do much to render the local condition more healthy.

(2) *Dry hæmorrhagic bronchiectasis and atelectatic bronchi*—Apart from the hæmorrhage associated with these conditions patients are not inconvenienced

and seldom require treatment except at the time of bleeding.

1 (3) *Apical bronchiectasis* from its position tends to keep drained, and seldom becomes as heavily infected as the basal varieties. If it does so the treatment is similar to that suggested in the latter form.

(4) *Basal bronchiectasis of small extent*.—In these cases, especially when bilateral, if the dilatation is only of slight extent it is difficult to decide the best treatment. They are usually young subjects, and one hesitates to recommend phrenic evulsion; we do not know to what degree they may recover, neither do we know that they proceed to the more severe type, lipiodol examination being of too recent origin for these cases to have been followed long enough. The course we follow is to inject the lipiodol every three to four weeks to wash out the dilatation, and, if a pure organism is isolated from the sputum, to give an autogenous vaccine, with the idea of avoidance of the recurrent pneumonic attacks they frequently have, each of which attacks is liable to increase the disease.

(5) *Extensive bronchiectasis*—These may be divided into the following.—

(A) The group who bring up foul sputum but the sputum is not retained at any time, who seldom have febrile bouts and show few toxic symptoms; by the use of postural drainage, creosote, or other disinfectants by the mouth, creosote chamber, and occasional injections of lipiodol, they are able to lead fairly comfortable and useful lives. Bronchoscopic drainage and lavage are definite adjuncts in the treatment.

(B) Those patients in whom the bronchiectasis is accompanied by febrile bouts and marked toxic symptoms. Postural drainage is of value, but bronchoscopic drainage and lavage are more useful here than in the previous type. When viewed through the bronchoscope it will be seen that above most of the bronchiectatic dilatations is a bronchus obstructed by inflam-

Lungs (Ballon)

- | | |
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(1) *Suppurative bronchitis and tuberculosis*—The bronchoscope renders the treatment of the mucous membrane as practicable as the treatment of the mucous membranes. Drainage, introduction of antiseptic solutions (such as 10 per cent. formalin), swabbing with antiseptics will do much to improve the local condition more healthy.

(2) *Dry hæmorrhagic bronchiectasis and tuberculous bronchiectasis*—Apart from the hæmorrhages, in these conditions patients are not in a

alleviation, or if an artificial pneumothorax is considered inadvisable from the first, the next step is a phrenic evulsion. In cases where the bronchiectasis is basal the success obtained by this measure is often very striking, the condition being relieved to such an extent that the patient is not prepared to take further risks. In quite as many cases, however, success is only partial, and a further operation has to be considered, namely a thoracoplastic one. According to the extent of the lesion, so will the extent of the thoracoplasty vary. Here again it is impossible to say how great will be the relief afforded by this operation until the operation has been done. If, after the procedure, the symptoms have not been sufficiently relieved to make life safe and comfortable for the patient, the operation of cauterly lobectomy must be considered. This surgical measure is one that is so severe that at present it is seldom that the physician takes the responsibility of advising the patient to face it. A procedure which is less radical, but which often meets with considerable success, especially in children, is an extrapleural pneumolysis.

Lung abscess.—In this, as in bronchiectasis, the *sine qua non* of treatment is free drainage. If not obtainable *per via naturalis*, external drainage must be resorted to. An important point to remember in treatment is that 40–50 per cent of the cases, once they have made communication with a bronchus and are draining themselves by this route, will heal by conservative medical treatment. The percentage is probably even greater if we take into account the number of undiagnosed cases.

The medical treatment resolves itself into supporting the general condition of the patient, particularly the cardio-vascular system, giving stimulating expectorant mixtures, with strict avoidance of any sedative which decreases the cough reflex, and particular attention to postural drainage and general hygienic measures as in

tuberculosis

An incomparable adjunct to this treatment is the drainage of the abscess by means of a drainage tube passed through the "bronchus of drainage" under guidance of the bronchoscope. The drainage is done twice weekly, if possible. The instillation at the same time of 10 per cent. gomenol seems to aid, and, in cases where we have suspected the presence of a post-influenzal abscess, has seemed to expedite resolution. Drainage is successful in those cases to which it applies, not only on account of the aspiration of the pus at the time of the bronchoscopic drainage, but also because the drainage opens up the bronchus leading to the abscess, which, owing to inflammatory changes, obstructs the passage of the pus, the procedure is not applicable in those cases in which the abscess is situated at the periphery of the lung. This line of treatment should always be given its chance before considering any surgical interference except in very exceptional circumstances; if the patient is improving, it should be continued for at least two months from the onset of the abscess. Even in abscess coming under observation some considerable time after its onset this procedure should be given a trial, for it often meets with complete success, and it is because of the success of these conservative measures in so large a proportion of cases that practically all authorities on this subject are in agreement that these measures should be continued for 8-12 weeks unless the patient is obviously losing ground.

Further, not only does medical treatment hold out a very considerable chance of success, but it also gives time for the abscess to become more definitely "shut off" and so more amenable to surgery.

Drugs — While the above-mentioned medical measures are being carried out, the drugs which are reputed to be of value in the treatment of this condition should also be tried. For instance, emetine,

1 grain daily for 8 to 12 days. In some cases we have seen dramatic results following the administration of this drug, in more cases we have seen it to be of no value, yet we have never seen it do harm.

In those cases in which spirochætes are recovered from the sputum, the giving of arsenical preparations intravenously has been recommended; to this procedure the same remarks apply as to the use of emetine.

Artificial pneumothorax.—When the abscess is well defined and is draining through a bronchus, and is situated near the root of the lung, artificial pneumothorax induced and kept up for some months will often "cure" the condition. The danger is the possible production of a pyopneumothorax. Although this complication is looked upon as a very dangerous one, we have seen it occur four times, and, on three occasions, after drainage of the pyopneumothorax, a complete recovery was made. It is interesting to note that a Continental worker has suggested and carried out with success in a number of cases this production of a pyopneumothorax with subsequent drainage as a curative measure for the treatment of lung abscess.

It must be remembered that no method of compression of the lung will be satisfactory unless there is a free exit into the bronchial tree. Thoracoplastic operations and phrenic evulsions are seldom successful in procuring the healing of an abscess. The value of these operations is to be found in the obliteration of a cavity which may be left when the abscess is drained externally.

In our experience the most successful surgical procedure is external drainage, carried out under a local anæsthesia. It should be performed as a two-stage operation. Stage one, the pleura should be explored, and, if found free, it should be plugged so as to cause adhesions to form. When the adhesions have shut off the pleural cavity four to six days later, the secondary

stage of opening the abscess and inserting a drain should be carried out. Flick's suggestion that, at the time of the first procedure, a large portion of two or three of the neighbouring ribs should be resected so that compression is brought to bear on the abscess seems a very useful additional procedure.

If, at the first stage, the pleura is found firmly adherent, as is not uncommon, then drainage may be carried out at this stage.

We feel that more can be done than has been done in the past for these cases by the use of systematic bronchial drainage and medication. This method has long been advocated by Chevalier Jackson, and is used much more in America than in this country.

A general anæsthetic should never be used. It is unnecessary and dangerous, it often makes the patient ill for days, and may easily be the cause of a spread of infection. Patients with malignant growths in the bronchus, after bronchoscopy with a general anæsthetic, often seem to be particularly "knocked out."

Given a suitable local anæsthetic, the passing of a bronchoscope is not at all distressing to the patient, patients generally prefer it to a lipiodol injection, and in a series of 200 examinations—old, young, nervous and phlegmatic—we have had no case who has made any complaint of inconvenience or pain. We employ the technique of Haslinger, which he kindly demonstrated to us in Vienna. A small dose of atropine and morphine is given before the first examination. The passages are anæsthetized with cocaine and the patient assured that the procedure is not either dangerous or painful. The patient walks to the table and can walk away after the operation, and is quite prepared for further treatment if and when necessary. As a routine we use the Haslinger bronchoscope, this has proximal illumination, and extension tubes render it possible to reach the smaller bronchi, the light is excellent, does

not dazzle the eye or become obscured with secretion, moreover, it shines down the bronchial tree so that the branches can be seen to their full extent. We occasionally use the Jackson instrument in cases where a local light is an advantage, as, for example, obtaining



FIG 1 —Ordinary X-ray of lung abscess. Lipiodol failed to enter this area.



FIG 2.—Bronchoscopic pneumogram (prone) Upper area is abscess, lower areas have massed alveolar distribution.



FIG 3—Same Lateral view (upright)

Three levels show air, pus, lipiodol

pieces of growth for biopsy, but for general purposes the former instrument is the one of our choice

The skiagrams show the value and use of the bronchoscopic X-ray lipiodol picture (called for brevity a bronchoscopic pneumogram) Usually it is the only means of getting the cavity filled with lipiodol, which is essential for accurate localization if the case should come to operation and for deciding if it is suitable for operation

Our thanks are due to Drs. J. V. Sparks and F. Wood for the skiagrams

structure which traversed its wall. Such closure is therefore a vital process. When the bladder is partially distended the muscle fibres are lengthened and would tend to loose their hold on the intramural ureter. But now another, a valvular or mechanical hindrance, is substituted in the shape of the small curtain of mucosa which forms the lowest limit of the anterior wall of the ureter. For a cusp to be efficient there must be pressure on its surface. There is not any pressure in an empty bladder and the cusp is therefore incompetent till the bladder is partly filled, when the forces necessary to depress the valve cusp are supplied. Intravesical tension then holds it back against the posterior wall at the uretero-vesical junction. The greater the intravesical pressure the more firmly the orifice is closed. Valvular integrity does not depend on the strength of the fold of mucosa, for the latter is in its turn supported by the vesical wall. It is therefore impossible for it to be forced or become incompetent in the way one would be led to suppose from many statements in books and journals.

How, then, does back pressure reach the kidney? First let us look at the normal behaviour of the ureter. As a rule this tube is empty. Periodically a peristaltic wave passes along it, bringing urine which has collected in the kidney pelvis down to the bladder. The ureter is a very thin walled tube, its musculature being many times inferior to that of the bladder. In order to ensure the safe delivery of its contents into the filling bladder the ureter adopts shock tactics and shoots them into that viscus at a speed which carries them right across the cavity* (consider the appearance seen at cystoscopy when indigo-carmin swirls into the bladder). When delivery is accomplished the valve is slammed back and the door is closed. The ureter is empty again until the process is repeated. But its power is limited, and as

* The peristaltic wave of the ureter travels at the rate of about 20-30 mm. per second. (Lana Stern *Thèse de Genève*, 1903.)

that the kidney suffers severely in many instances. Not infrequently a patient during such a spasm will complain of severe pain in the loin—a sure sign of the incompetency of the uretero-vesical valve and an indication that damage is being done to the kidney.

Bladders palpable above the pubes vary considerably in their tenseness, some are flaccid to the touch, others are firmer. The former are discovered in men who have suffered a gradually increasing distension, possibly without their knowledge, for a longish time. The latter are to be found in cases of acute or recent retention. As a rule the tension in the flaccid type will correspond to a column of urine about 25 to 30 cm in height, whereas the tense bladders will show a column of about 40 cm. In practice these figures are frequently noted, because in one method of relief the patient's bladder is gradually emptied against the pressure of a column of his own urine. Both types require the greatest care in treatment if grave renal injury is to be avoided. It might be expected that the tense bladder would have caused more injury to the kidney than the more flaccid one, but in actual fact this does not follow, for the latter has been producing its nefarious effects on the kidney for a long time, whilst the former is probably of more recent date.

Effects of pressure on the kidney—First consider the results of back pressure on the circulation of the kidney. Whilst under compression it is subjected to a pressure ischæmia which on release gives place to hyperæmia and œdema. The anæmia of the kidney is probably responsible for a part, perhaps an important part, of the uræmia so evident when some prostatics are first seen. Heidenham showed that by clamping the renal artery for a few seconds the kidney was put out of action for a prolonged period. Simultaneously the renal cells are compressed between the distended pelvis and the firm capsule. It is difficult to assess the parts played respectively by vascular and cell compression.

It is, however, possible to speak with much more certainty about the effects of releasing that pressure from the kidney, for the ischæmia gives place immediately to engorgement if the release is quickly carried out. In some cases even when skilfully and properly executed the same results occur. The clinical picture is then one of the most striking and menacing in urological practice. Its pathological counterpart is renal hyperæmia associated with an effusion which may become hæmorrhagic in severe cases. Engorgement may manifest itself clinically in albuminuria, hæmaturia and possibly suppression, whilst the clinical and laboratory evidences of uræmia become more pronounced. To handle an obstructed patient in such a manner that renal engorgement is reduced to a minimum is the crux of successful treatment. The keynote is the slow evacuation of the bladder and the very gradual reduction of pressure. Yet in some measure the artificiality of the relief must be responsible, for when one observes a patient overcome his own obstruction by passing urine naturally there is much less likelihood of uræmic symptoms supervening in spite of the sudden drop in pressure. Into the causes for this I have not space to enter.

If the bladder is septic, or becomes septic from catheterization, infection will, when the two compartments become one in the way already described, have direct access to the kidney by the continuity of the urinary column and will be transmitted into the depths of the organ because of the dilatation of lymphatic and renal channels, to which attention will shortly be drawn. This sepsis may have been present prior to the onset of obstruction, but is very liable to arise when measures of relief are instituted.

I want to go on now to a sideline for a time in order to explain certain other events which take place in the obstructed kidney. Its relevance to the

present study will soon be evident.

In recent years it has become an almost universal practice when examining for renal disease to fill the kidney pelvis with some solution which is opaque to the X-rays and to radiograph it (pyelography). When this examination first came into favour occasional ill-effects, including a number of fatalities, resulted from faulty technique. At the necropsies the silver salts, which at that time were employed for pyelography, were discovered in the kidney substance, perirenal tissues, and in distant organs (lungs, liver, etc.) as emboli, and it became obvious that some mechanism existed by which intrapelvic contents could pass into the circulation.

Before the introduction of pyelography many observations had from time to time been made on the resorption capacity of the kidney, most of which had received little attention. Thus Ribbert (1883) injected the pelvis of one kidney with potassium ferrocyanide and recovered that substance from the urine excreted by the opposite kidney. Poirier (1891) experimentally showed the retrograde permeability of the kidney. First he injected fat under pressure into the pelvis of dogs and watched it pass into the renal vein and venæ cava. He then reversed the process, introducing fat into the renal vein and recovered it in the pelvis. In another experiment he used water, which, when a certain level of intrapelvic pressure was reached, ran out from the renal vein. Since then numerous observers have repeated and confirmed these results using all manner of materials for purposes of injection. The striking facts are: (1) that at a certain pressure level reflux from the kidney takes place into the general circulation (pyelo-venous reflux) and (2) that products regurgitating into the circulation of one kidney may be recovered in the urine of the opposite organ. Recently the whole question has excited interest amongst urologists especially in its bearing on pyelo-

graphy, a procedure in which the conditions for a clinical repetition of the experiment constantly face the operator. But a moment's reflection shows that it must have at least an equal interest in cases of urinary obstruction, for if the pressure rises to the requisite level, regurgitation of pelvic contents into the circulation must inevitably ensue. The study of pyelography has thus thrown a sudden and unexpected light on the problems of urinary retention which we are at present considering. In prostatic disease, which I have particularly in mind, one or both ureters may be affected or one may be involved before the other, but in severe or late cases both must be regarded as involved—the obstruction is bilateral. For the moment, however, it will be convenient to consider the effects of occlusion of one ureter, when this occurs, either experimentally or by some pathological process, a definite train of events is set in motion. At first urine is passed into the empty pelvis and ureter and continues to be secreted until a certain tension is produced, when secretion stops. The point at which it stops is called "the secretory pressure." It is variable in different animals and in different circumstances, being dependent on many constantly changing factors of which the most important are the blood pressure and diuresis*. Under general conditions the maximum secretory pressure lies about 40–60 mm. of mercury below that in the aorta†. Blood pressure and diuresis show many variations in elderly prostatics and the secretory pressure must vary within somewhat wide limits, but will on the whole tend to be definitely above the average for the human subject.

Experiments to show at what level reflux commences have been frequently made. Landemann (1904) was

* For full consideration see Cushny's "Secretion of Urine," p 110 *et seq*.

† Again, "The maximum ureteral pressure is reached when the osmotic resistance of the fluid in the tubules balances the absorbing force" (Cushny).

probably the first to undertake this test, and recently it has been repeated by Hinman and Lee Brown and others. Hinman estimated that a pressure of 20 mm. of mercury was necessary in a sheep's kidney to obtain slow permeation, but that with 30-40 mm of Hg a rapid filling of the renal veins occurred. Once this flow has been established it could be maintained by a relatively low pressure. But all these pressures are obviously below the secretory pressure, and it might therefore be surmised that if the ureter were simply ligatured the kidney's own secretory pressure would provide sufficient tension to cause a reflux. That this is so was shown by Tuffier (1894), he placed in the ureter a very small bulk of strychnine solution and ligatured the tube. No effects were noticed until the secretory pressure produced a reflux, when the animal quickly died from strychnine poisoning. In a similar series of experiments undertaken by Hinman and Veckl, phenolsulphone-phthalein was imprisoned in the ureter. The contents of the ureters examined at various times thereafter showed that the dye gradually disappeared. It may therefore be accepted that when the kidney outlet is occluded excretion goes on until such an elevation of the intrapelvic pressure has occurred that conditions favouring a pyelo-venous reflux are established. The contents of a hydronephrosis are therefore not constant, there being an exchange continually in progress, the newly excreted urine displacing more and more of the original pelvic contents.

In a unilateral hydronephrosis, as shown in the experiment of Ribbert quoted above, the contents under compression in one renal pelvis were re-excreted by the opposite kidney. This experiment can be repeated during any cystoscopy in which double catheterization of the ureters has been carried out. Iodine salts introduced into one kidney for pyelography can within five minutes be demonstrated in the urine coming from the other side, showing that, even with the precautions

used in pyelography, the blood stream receives some of the injected solution

So much for unilateral obstruction. But if the obstruction is of the lower urinary tract three additional factors come into play. (a) Both ureters are obstructed and there is therefore double the quantity of reflux; (b) There is no kidney available to re-excrete, (c) The secretory pressures, which unaided were responsible for the production of tension in unilateral obstruction, are augmented by the intravesical and intra-abdominal pressures as above described. From these conditions it follows that the toxæmia of bilateral obstruction much more than duplicates that caused by unilateral occlusion.

The routes by which pelvic contents reach the circulations—Into this vexed problem it is unprofitable at the present to enter in any detail, but one or two facts must be mentioned. In different circumstances there is more than one route available. Injected fluids have been found in the urinary tubules, and in the renal lymphatics and interstitial tissues. But perhaps the most important and unexpected route is a direct traumatic one which produces a connection between the calyces and the veins. It is known that surrounding the calyces as a more or less complete ring (Traut) are large veins lying in close contact with the wall of the calyx. This contact becomes yet more intimate when the calyces bulge from over-distension. There is a weak point in the wall of the calyx where its free or unsupported part is reflected on to the papilla of the kidney (fornix calycis). At this point a comparatively trifling tension may cause a tear, and owing to the close proximity of the venous ring this tear is liable to extend directly into the vein. In experimental specimens multiple tears may be seen. In this variety of pelvic regurgitation therefore a direct communication between the pelvis and the venous system is established.

In another form regurgitation is stated by some

observers to pass first into the collecting tubules and from there into the circulation. In the human kidney tubular regurgitation is more easily produced than it is in the kidneys of some animals, *e g* the sheep (Lee Brown). It has been shown that in hydronephrosis reflux can be obtained at unusually low pressures, quite probably as a result of the existing dilatation of the tubules. If it is recalled that many prostatic kidneys are already dilated from partial obstruction before complete retention occurs, it will be readily realized how vulnerable they are and how easily reflux into the circulation may be produced.

Healthy urine in the circulation is intensely toxic. The lower animals are killed by the introduction of about 6 c cm of human urine per kilo of body weight. What its relative toxicity is for man I do not know, but it is certainly a very unwholesome addition to the circulation. In many cases the urine is septic and as such must pass directly into the venous stream. The importance of this to the health of the patient calls for no comment.

Conclusion.—I have sought to examine the processes leading up to incompetency of the ureteric valve and the sequelæ. Once the valve is incompetent it becomes necessary to form a mental picture of dilatation not only of the pelvis but also of the urinary canaliculi, to visualize pressure atrophy of the parenchyma, vascular compression and pyelonephritis. Regurgitation directly into the circulation, of water, urinary excreta and perhaps bacteria also occurs. A close inspection of these sequelæ does not conduce to complacency in the handling of such cases.

Diathermy in Urinary Surgery

By ARTHUR JACOBS, F R F P S

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UNDER the term "High Frequency" are included electrical actions of various types. These actions may be produced either with the active electrode in contact with or at a distance from the tissues and will vary accordingly. If an electrode is applied directly to the tissues or buried in them, two possibilities present themselves:—first, if the contact is made with a large electrode of about the size of the hand, there will occur the simple phenomenon of heating to about 50° F. or 60° F. This is medical diathermy and is without any operative interest. On the other hand, if the action is made on a limited area by means of a small-sized electrode a temperature of from 300° F. to 800° F. can be obtained and carbonization will occur. This is surgical diathermy or electro-coagulation. If a piece of tissue which has just been subjected to electro-coagulation be examined, two zones of destruction, differing in appearance, will be observed. In the centre there will be seen a black area of carbonization and immediately external to this a whitish zone of coagulated tissue. In addition, a third zone of secondary necrosis makes its appearance about twelve days later. If the application of high frequency is made from a distance, that is, if the electrode is not in contact with the tissues, the effect on the latter is produced by sparks which will project from the electrode through air or fluid. This form of high frequency is termed "Etincelage" or sparking, and with a suitable diathermy machine¹ can be produced by raising the voltage and lowering

the amperage of the current Etincelage is more limited in its action and causes a lesser degree of destruction than electro-coagulation.

New growths of the bladder.—The most important use of high frequency in urinary surgery is in the treatment of vesical papillomata. About 90 per cent of all bladder tumours are of epithelial origin, and simple papillomata are as frequent as all the other types put together. The condition must be looked upon with suspicion, for a neglected simple papilloma has a very definite tendency to become malignant. They occur most frequently between the ages of 40 and 50. Hæmaturia may be the only symptom, it is usually intermittent, spontaneous and painless in character and tends to occur at the end of micturition. Since even a single attack of hæmaturia indicates the possibility of a vesical tumour, a cystoscopic examination should be made on every patient exhibiting this symptom. By this means diagnosis is usually easy, though in delayed cases, with painful urination and profuse hæmaturia, cystoscopy may be painful and difficult as a result of vesical intolerance and cystitis. Two main types of papillomata are observed through the cystoscope. Both varieties may be single or multiple and are most frequently observed at the base of the bladder to the outer side of the ureteric orifice. They are also found on the lateral wall, on the dome and on the anterior wall, but never on the trigone. One type is the pedunculated papilloma, the branching villi of which can be observed waving about in the fluid which distends the bladder. These pedunculated tumours are usually benign. The other main type is the sessile papilloma, which varies in appearance from tiny velvet objects to large masses almost filling the bladder. These sessile tumours show a marked tendency to infiltrate the bladder wall and become malignant. Between these two types many

variations may be observed

There is no longer any controversy regarding the treatment of election of simple tumours of the bladder. It is by high frequency through the natural passages and under cystoscopic view. The materials necessary for this treatment, in addition to a high frequency machine controllable by a foot-switch, are a single catheter cystoscope and a supple electrode. Frank Kidd² has devised a cystoscope the terminal end of which is used as the electrode. The necessity for anæsthesia depends a great deal on the temperament of both the patient and operator. I am in favour of caudal or spinal anæsthesia. One or more treatments may be necessary, lasting from a few minutes to as long as an hour. If the papilloma is of the pedunculated type it is destroyed by electro-coagulation, that is, the electrode is placed in contact with the tumour and is connected to the high intensity current of the apparatus. When the base of the papilloma is reached, the less destructive etincelage or sparking is substituted for electro-coagulation. In treating sessile papillomata electro-coagulation should be used throughout, repeated applications are made until the tumour is about a quarter of the original size. It is to be remembered that destruction after high frequency continues for weeks after the end of the operating act. A catheter should be tied into the urethra for 48 hours after treatment and the bladder irrigated several times during that period with a weak nitrate of silver solution. The destroyed portions of the tumour are thus washed away. After the sittings are completed, cystoscopic examinations of the bladder should be made every one to three months for a year and at intervals of six months during the following year. Should relapses occur, they are treated in the same manner as the original tumour.

When a growth is situated at the apex or near

the internal meatus of the bladder, it may be impossible to guide the electrode into contact with it. In this event a suprapubic cystostomy must be performed and the tumour treated by high frequency through the open bladder. By using a retrograde operating cystoscope such as that of Swift Joly,³ however, the necessity of opening the bladder in order to reach growths situated in these regions will in most cases be obviated.

Unfortunately, high frequency is not indicated for malignant growths of the bladder, for it appears to have no curative effect. If, however, the situation or the extent of the growth negatives a partial cystectomy, the condition of the patient may be ameliorated by diathermy, which reduces or completely stops hæmorrhage and retards the rate of spread.

The prostate — Prostatic obstruction due to "middle lobe" enlargement or "prostatic bar" is effectively treated by electro-coagulation. Probably, several different pathological changes play a part in the etiology of this condition. Increase of fibrous tissues following on previous attacks of inflammation of the prostate, increase of glandular tissue in the bladder neck, and localized enlargement of the prostatic gland are the causes variously described for this form of prostatism. Clinically, it is recognized by symptoms of prostatic obstruction occurring in a patient usually under sixty, who, on rectal examination, shows no evidence of prostatic enlargement. A definite diagnosis is only possible after cysto-urethroscopic examination, which reveals a thickening of the posterior segment of the bladder neck.

If in these cases the bladder is opened, a small fibrous gland is found, which can usually only be removed by open dissection. When skilfully performed satisfactory results may be obtained by this procedure. Not infrequently, however, following on

an attempt to remove the prostate by the usual digital method of enucleation, a haphazard piecemeal removal results which fails to relieve the patient of his obstruction. The per-urethral operation,⁴ by which the obstruction is destroyed by electrocoagulation, avoids these difficulties and is a procedure in which the mortality is practically nil. The technique is similar to that used for the treatment of vesical papilloma. Instead of the cystoscope, however, a cysto-urethroscope is employed, and continuous irrigation of the bladder must be kept up throughout the seance.

Cystitis—Cases of simple chronic cystitis which have resisted the classical treatment of bladder lavage and instillations give excellent results when treated per urethra by etincellage or sparking. This form of treatment is especially beneficial in inflammatory lesions of the bladder neck, a condition more common in women than in men. Polyuria, pain and other signs of cystitis may be inexplicable until a thorough examination of the crest, the urethral and the vesical aspects of the bladder neck reveals an area of chronic inflammation, sometimes so marked as to resemble a leukoplakia.

Tuberculosis of the bladder—It is not an uncommon experience to find tuberculous ulceration of the bladder persisting for months after the removal of the kidney which has caused the bladder infection. Instillations into the bladder of such preparations as gomenol oil or methylene blue usually improve the condition, but may fail, however, to banish this rebellious type of ulcer. In that event, etincellage of the ulcer and of the neighbouring mucosa affected with cystitis frequently gives excellent results. In addition, a thin electrode may be passed up the ureter on the affected side and the mucosal lining destroyed. High frequency of tuberculous bladders is usually very painful, and some form of anæsthesia

is therefore essential.

Impacted calculi in vesical end of ureter. — A stone may become incarcerated in the vesical end of the ureter as a result of stricture or of extensive œdema around it. In the former case the orifice can be enlarged and the stone released by burning through the mucous membrane at a point over the impacted calculus.⁵ When extensive œdema is the cause of the obstruction, sparking over the affected area will reduce the swelling, following on which the stone may be passed spontaneously.

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Ludwig's Angina

By HAMILTON BAILEY, F.R.C.S.

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IN 1836, Wilhelm von Ludwig, a physician of Stuttgart, contributed to his local medical journal an account of five examples of what is now known universally as Ludwig's angina. At that time the possibilities of surgical drainage were not appreciated, and three out of these five cases succumbed. Ludwig described a clinical entity characterized by a brawny swelling of the submaxillary region combined with inflammatory œdema of the mouth. It is the *combined*



FIG 1—Ludwig's angina. The brawny swelling beneath the jaw and the œdema of the floor of the mouth (which can be seen in the photograph) are characteristic features of the condition.

cervical and intrabuccal signs which constitute the characteristic feature of the condition (Fig 1). To quote Ashurst: "It may begin in either situation, but until it spreads from the submaxillary

to the sublingual tissues, or in the reverse direction from the sublingual tissues to the submaxillary region, it does not constitute Ludwig's angina."

ORIGIN OF THE INFECTION

Ludwig showed that the essential pathology of the condition was infection of the cellular tissues about the submaxillary salivary gland. Infection of this space may occur in several ways —

From an alveolar abscess—Contrary to what we might expect, it is an abscess connected with the last lower molar which is prone to infect this periglandular space, for the following reason. Alveolar abscesses commonly point on the labial side of the mandible, for the outer alveolus is the thinner. In the region of the wisdom tooth, however, it is the inner alveolus which is weaker, consequently, if an abscess connected with the last molar breaks its confines it is more liable to burst through the inner side of the jaw.

From an inflamed submaxillary salivary gland—Most authorities state that infection by this route is infrequent, or that it does not occur. It happens that in two out of five examples of Ludwig's angina which have been under my observation the patient has had a stone in Wharton's duct. Details of these cases were published in THE PRACTITIONER.

From lymphangitis—Although the main lymphatic glands of the submaxillary triangle are superficial to the fascial space in question, doubtless infection can be conveyed thither by the abundant lymphatic vessels around the salivary gland, a boil on the chin being a common primary focus.

COURSE OF THE DISEASE

Unless tension is relieved certain cases rapidly assume a grave aspect. The swollen tongue is pushed towards the palate and forwards through the open mouth, while the cervical cellulitis extends down the

neck in that most dangerous plane—deep to the deep fascia. Only too often, within 12 to 24 hours the patient's life is threatened or taken. At necropsy upon a man of 42 who died of Ludwig's angina soon after admission to the Liverpool Royal Infirmary, Bickersteth found "nothing abnormal superficial to the deep cervical fascia, but beneath that structure a diffuse cellulitis. All muscular interstices and the connective tissue surrounding the trachea were infiltrated with sero-purulent fluid extending upwards to the root of the tongue and downwards to the anterior mediastinum." Cultures show that in about 70 per cent of cases the infecting organism is a streptococcus

PECULIAR DANGERS OF LUDWIG'S ANGINA

I am strongly of the opinion that in early stages of *subcutaneous* cellulitis it is better to withhold the knife. In Ludwig's angina the position is entirely different. Here we are confronted with infection of a fascial space walled in on all sides by dense fasciæ and muscles, a space where clinical experience and experimental injection demonstrate that inflammatory exudate can, and does, pass via the tunnel occupied by the stylohyoid to the submucosa of the glottis.

The integument allows inflamed subcutaneous tissue to swell; the cervical fascia is unyielding, and in this respect may be compared to periosteum. Obviously, therefore, if it is logical to decompress immediately the infected area in osteomyelitis it must be doubly so in Ludwig's angina, for in the latter condition there are all the dangers of impending septicæmia combined with a possibility of early œdema of the glottis.

OPERATIVE TREATMENT

The objective is a ~~communication~~ communication between the fascial space and the exterior. Early in the disease this can be easily, and often effectively, accomplished

in the following way. A deep, really deep, incision is made along the middle two thirds of a line joining the symphysis menti with the centre of the hyoid bone (Fig 2). A hæmostat is inserted and thrust upwards until its blades protrude almost beneath the sublingual mucosa. If the disease is limited to one submaxillary triangle the beak of the forceps is directed towards the submaxillary salivary gland of that side. When it is judged that the fascial space has been entered the blades are opened. A drainage tube is passed into the incision and copious dressings soaked in hot



FIG 2—Ludwig's angina. A deep incision in the position indicated, passing almost to the sublingual mucosa, proved effective in this comparatively early case.

magnesium sulphate solution applied. General treatment follows the usual lines for a severe streptococcal infection.

While operative measures as outlined above, if carried out early, are often satisfactory, it is probable that more thorough decompression of the space would reduce the total mortality of the condition, which at the present time is about 30 per cent. More elaborate decompression is imperative when simple incision fails to give relief, and it was this circumstance that led Leonardo to make a wide transverse incision dividing

the mylohyoid and geniohyoid muscles. Later, van Wagener and Costello found that primary division of the cervical diaphragm was attended by excellent results, and these authors advocate division of the mylohyoid as a standard measure for established Ludwig's angina. I adopted their suggestion and in a fulminating case in a woman of 70 obtained an encouraging result. The technique is as follows. A wide incision is made at the base of the submaxillary triangle following the lower border of the jaw (Fig 3). The facial artery is identified and divided between



FIG 3 —Incision for compressing thoroughly the space beneath the mylohyoid muscle

ligatures. The submaxillary gland is retracted and the mylohyoid muscle divided completely. Often pus will be found under the mylohyoid muscle around the deep prolongation of the submaxillary gland. It may be necessary to carry the incision right across to the other side, and where oedema is extreme to convert the transverse incision into a T by a mid-line prolongation to the hyoid.

SPECIAL CAUTIONS

- (1) *Anæsthesia* — Nitrous oxide gas should be

avoided As pointed out at a coroner's inquest upon a case of Ludwig's angina, gas is a "spasmodic" anæsthetic A certain degree of local anæsthesia is possible by blocking the cervical nerves behind the posterior border of the upper third of the sternomastoid Such local anæsthesia reduces considerably the amount of general anæsthesia required

(2) *Tracheotomy instruments*—These should always be at hand until the acute inflammation has definitely subsided Tracheotomy may become necessary, but if the area has been thoroughly decompressed it should not be undertaken unless there are definite signs of commencing asphyxia. With the tongue pushed up to the roof of the mouth the patient experiences a feeling of impending suffocation, but reassurance, ice to the tongue, and the inhalation of some oxygen has, in the cases which I have seen, proved effective

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The Diagnosis and Treatment of Coronary Thrombosis

By G S HAYNES, M D , M R C P

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ONLY during the past few years has it become evident that coronary thrombosis gives rise to a definite syndrome of signs and symptoms which may be readily recognized clinically. It appears that the condition is seen more frequently in private than in hospital practice, and it may be that the incidence is increasing. According to Willius it is probable that acute coronary obstruction is on the increase in America, although diagnosis is becoming more and more accurate. Carey Coombes says he tentatively diagnosed cardiac infarction once before the war, since the war he has diagnosed it in many instances.

Apparently there is no one specific disease that may be said to precede or cause coronary sclerosis and thrombosis. The common infectious diseases, foci of infection or acute infections do not play a part in causation. Levine says that diabetes has an intimate relation to arterial disease and to the development of coronary sclerosis. 23.7 per cent of his 145 cases were glycosuric. He believes that diabetes has no causative influence in the disease but merely indicates the type of person who has a vulnerable vascular system. Syphilis is not a common cause, 4.5 per cent of eighty-nine cases gave a positive Wassermann reaction. It is generally true that coronary thrombosis is the end result of previous angina pectoris in some or other degree. In many cases where the attack seems to have been the first indication of any existing heart disease, close questioning may elicit the

fact that for some months or even years there has been definite constriction in the chest on hurrying or some other significant complaint. On the other hand some have apparently been in perfectly normal health in every way until the catastrophe occurred. It is probable that a previously existing hypertension is a factor in the majority of cases, but it is clear from reported cases that a high blood-pressure is not essential. Some cases show evidence of sclerosis in the radial, brachial, temporal and retinal arteries, but there are many in which little or no signs of arterial disease can be found.

The condition is found much more commonly in males than in females. Parkinson and Bedford report ninety-three males and seven females in a series of 100 cases. Willus in America gives the proportion as $4\frac{1}{2}$ -1. Men as a group have been subjected to greater stress and strain than women; it may be that with the equality of the sexes the proportion will be reduced. Cases occur between the ages of 40 and 70, with the maximum age incidence about 60 years. The onset is usually sudden and may be the first indication of heart disease, or there may be a history of preceding painful heart attack, dyspnoea on exertion, or attacks of shortness of breath. The attack as a rule has no relation to exertion or to a meal, and frequently occurs when the patient is at rest, even when in bed at night. One of three things may happen—sudden death, intense pain, or urgent dyspnoea.

The group of patients in whom death occurs instantly, or in a very short time, is comparatively of less clinical interest than that in which the immediate result is not fatal. These cases frequently become problems for the coroner, who has long been familiar with coronary disease as a cause of sudden death. In some cases the lumen of the main channel is patent, and there is no gross macroscopic ventricular disease. In others the has become obstructed more or less completely

by a mixture of softened and calcified material, the final complete obstruction by a thrombus bringing the co-ordinated activity of the muscle to an end. Probably in all these cases fibrillation of the ventricle is set up, and the circulation thereupon comes to a standstill. Ventricular fibrillation follows ligation of the coronary arteries, and has been found in some cases in which electro-cardiograms of the dying heart have been recorded.

If death is not instantaneous we may learn that the patient was seized with a pain of agonizing severity, more intense than anything in his experience. In most cases the site of the pain is in the region of the sternum, often towards the lower end, and occasionally in the upper abdomen. The pain is constricting in character and may radiate to the neck, throat, shoulders, back, or arms, more often to the left than to the right.

The attack may cause collapse and loss of consciousness; more frequently the patient complains of extreme weakness, or he may writhe in agony or even walk about and try various changes of position. This is in marked contrast to the behaviour of a patient in an attack of angina pectoris, in which he usually keeps as still as possible.

The pain is usually persistent and may last hours, or even several days. After the extreme severity has been eased by morphine a dull ache usually remains for some days. Nausea and vomiting are common. Levine writes "There frequently is vomiting at the onset of the attack, and it is this feature and the general feeling of distress that make the patient, the family, and the physician believe that the attack is one of acute indigestion, a term that should be given up entirely in medical nomenclature, especially when it ends fatally, for then it practically always is incorrectly used to describe an attack of coronary thrombosis." There is usually a condition of shock, the patient becomes cold and pale, with sweating and an ashen-grey

colour. The pulse will be found to be small and rapid, or impalpable, and the blood-pressure quickly falls, to about 100 if it has been previously normal, and 25 or 30 per cent of the original amount in those who have had a high blood-pressure. The rise in pulse-rate and fall in blood-pressure are in marked contrast to what obtains in angina, where the pulse-rate remains unchanged and the blood-pressure, if it alters, rises. Dyspnoea occurs in almost all cases to some extent, and, especially in cases with pre-existing signs and symptoms of heart failure, may be the most striking and important feature, overshadowing the pain, which may, indeed, be absent altogether.

On examination the heart-beat will be found to be so weak that as a rule no impulse is visible or palpable, the sounds are faint; there may be a systolic murmur, the rhythm is at first regular, though after the onset of the attack almost any type of irregularity may come and go. The most important point is the quality of the heart-sounds, which are always muffled or distant, and may even be inaudible. A gallop rhythm, due to reduplication of the first sound, is apt to occur, and extrasystoles are not uncommon. In fact, almost any form of cardiac irregularity may be found. These are apt to be transient, and a careful watch should be kept for alteration of rhythm, as for pericardial friction. Any degree of auricular-ventricular conduction disturbance may be found during the early days following an attack, and partial or complete heart-block occurs. Other fairly common disturbances are auricular fibrillation and ventricular tachycardia, I have seen a patient develop paroxysmal fibrillation during the course of this complaint. Often within a few hours of the attack there will be a slight rise of temperature, it is usually about 100°, lasts from one to several days, and gradually subsides. Leucocytosis generally occurs very soon after the onset, the count usually showing 15,000 cells, and lasts as long as the fever

does. Infarcted tissue anywhere in the body probably liberates toxic products producing leucocytosis and fever.

In some cases, after an interval of a few hours to several days after the onset, a pericardial friction rub develops. When present, this is heard over the lower part of the præcordium between the nipple line and the sternum. In rheumatic pericarditis the rub is usually first heard at the base, in the third left space close to the sternum. This sign does not occur in the majority of cases, it was present in 13.8 per cent of Levine's 145 cases and in 7 per cent. of Parkinson and Bedford's cases. Pericarditis was found post mortem in 50 per cent of the former and 13 per cent of 83 examinations by the latter observers. Pericardial effusion is very rare and was only noted once by each of the authors quoted, that is to say, twice in 245 cases. The development of this type of pericarditis is clear. After the coronary vessel is occluded, the heart muscle which was supplied by that artery becomes infarcted. If the process of infarction is so extensive or so situated that it extends sufficiently to the surface to involve the visceral pericardium, local inflammation and irritation develop at the injured site. The infrequency of pericarditis is due to the fact that the infarction usually involves the endocardium, and is often separated from the pericardium by a layer of muscle which derives its blood supply from the epicardial vascular network. If the process involves the posterior or diaphragmatic portion of the heart no friction will be heard. However, when present, pericardial friction is a most valuable diagnostic sign.

Signs of venous engorgement may appear soon; the bases of the lungs often show the fine crepitations of cedema, and the liver may become enlarged and tender early.

In doubtful cases the aid of the electrocardiogram should be invoked, when certain changes due to infarcted muscle may be seen in the ventricular

made on the points shown in the table taken from Parkinson and Bedford's original description.

DIFFERENTIAL DIAGNOSIS

	Angina Pectoris	Cardiac Infarction
Onset - -	During exertion -	Often during rest or sleep
Site of pain -	Substernal - -	Substernal
Attitude - -	Immobile - -	Restive, may walk about
Duration - -	Minutes - - -	Hours or days
Shock - - -	Absent - - -	Present
Dyspnœa - -	Absent - - -	Usually severe
Vomiting - -	Rare - - -	Common
Sweating - -	Slight - - -	Profuse
Pulse - - -	Unchanged - -	Feeble, often rapid
Temperature -	Unchanged - -	Fever afterwards
Blood-pressure -	Unchanged or raised	Lowered
Congestive failure	Absent - - -	Often follows
Heart sounds -	Unchanged - -	Gallop rhythm or pericardial friction may appear
Leucocytosis -	Absent - - -	May be present
Electrocardiogram	May be abnormal -	Often diagnostic changes
Action of nitrites	Often give relief -	Give no relief

This condition must be distinguished from acute abdominal disturbance in those cases in which the pain is referred to the upper abdomen

A patient with coronary thrombosis may have sudden excruciating pain in the upper abdomen, with marked rigidity and tenderness, nausea, vomiting, fever and leucocytosis, and the condition may suggest gall-stone colic, perforation of an ulcer, acute pancreatitis, acute appendicitis, or acute intestinal obstruction. Here are the notes of such a case seen in 1916 by Levine

A male, aged 39, had been subject to anginal attacks for one year and was seized with a sudden pain in the epigastrium, radiating to the nipples. He had cough with blood-streaked mucus, and vomiting. Pulse rate 150, respirations 34. He was rather stuporous and cyanotic. Heart apex not felt, sounds distant and weak. Many

moist rales over left power lobe Tender indefinite mass extending from right costal margin to umbilicus Slight jaundice Upper abdomen very rigid Patient seemed to be in extreme shock Temperature 102° Leucocytosis 21,400 B P 92/80 He was thought to have an acute surgical condition and was anæsthetized, the differential diagnosis being acute pancreatitis, gall-bladder disease or perforated ulcer He died on the table On post-mortem examination there was an extensive infarct of the left ventricle, large mural thrombus, descending branch of the left coronary almost obliterated Nothing of importance in the abdomen except marked congestion of the liver

Pain in the chest, dyspnœa, cough, rales at the bases, fever and leucocytosis might suggest pneumonia, but the location of the pain, character of the breathing and action of the heart would help in making the diagnosis

The possibility that a hemiplegia might be due to an embolus from a left ventricular mural thrombus should always be borne in mind when it occurs in a patient with low blood-pressure It occasionally happens that the early stages of an acute infarction are mild and disregarded, and embolism may suggest the condition

Treatment —As soon as possible after the onset of an attack of coronary thrombosis morphine must be given freely, in doses of $\frac{1}{4}$ – $\frac{1}{2}$ gram subcutaneously or intravenously, repeated as often as is necessary to relieve the pain It is essential and there are no contraindications to its use The vasodilators, such as amyl nitrite and trinitrin, are useless, in contradistinction to true angina, and as they induce tachycardia and lower the blood-pressure, they are to be avoided An attempt should be made to induce absolute physical and mental rest, and after the acute phase has passed it is desirable to keep the patient in bed for at least four weeks, and preferably six During this time the infarct will heal and fibrose, and the risk of embolism from mural thrombi will become less and less. Digitalis should always be given in an endeavour to reduce the heart-rate and to avoid the onset of heart failure. It should be given in full doses at first, 20 minims every

four hours up to two drachms, and subsequently 15 minims every six hours, but care must be taken to avoid the production of any toxic symptoms. Later it is well to give theobromine sodium salicylate or diuretin in doses of 15 grains thrice daily. As I was able to show in a paper published in 1907, in collaboration with Prof Dixon, this drug dilates the coronary vessels and increases the force of the systole. Milder persistent attacks of substernal pain may be treated by a combination of theobromine with luminal, as in the preparations theominal and theogardenal. In syphilitic cases treatment by arsenobenzol preparations should be given, combined with potassium iodide. In such a case where pain was very obtrusive, relief was afforded by the inhalation of a drachm of chloroform. Small meals only must be taken, and a valuable addition to the dietary is an ounce of medicinal dextrose daily in lemonade.

Subsequently during a further period of six weeks a gradual return to a suitable occupation may be advised. The limitations of movement, exercise, and mental excitement, set by the appearance of pain or dyspnœa, must be strictly observed, and the daily life ordered accordingly.

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A Contribution to the Study of Intestinal Infection

By J STAVELY DICK, M B , B CH

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ONE of the incentives to embarking upon the work which it is proposed briefly to outline here was a not unnatural repugnance to preparing autogeneous vaccines from specimens of fæces without obtaining presumptive evidence that there was an intestinal infection. The method of investigation adopted was largely determined by the apparent success of vaccine-therapy in a case referred to elsewhere¹

The enormous number and variety of microbes in the human intestine make the possibilities of evil at first sight seem appalling—so appalling, indeed, that, from this standpoint, one might almost condone the enterprise of the surgeon who, contemptuous of half measures, creates a new record by excising the intestinal tract *in toto*! On the other hand, Cruickshank² reassuringly points out that the intestinal mucosa has peculiarly selective absorptive powers and that our apprehensions are largely imaginary. This is obviously true, as so many people are alive and, as a matter of fact, continue to live to a good old age. A cursory reader of Cruickshank's instructive paper may, however, be lulled into a sense of security greater than the facts justify. A child, for example, is fed on milk from a tuberculous cow and later develops hip-joint disease. How did the tubercle bacilli find their way to such a joint? The presumption is, I think, that the barrier to infection interposed by the intestinal

mucosa was not in this case an efficient safeguard against bacterial invasion of the lymph or blood-stream Green and Mellanby³ have demonstrated that, in certain laboratory animals, infection or, as the case may be, non-infection is contingent upon appropriate nutrition of the animals in question. These very interesting experiments appear to support the clinical impression that intestinal infection plays an important part in various chronic ailments

With these considerations in view, I have for over three years been endeavouring to obtain some presumptive evidence of intestinal infection, or its absence, in over a hundred patients suffering either (a) from various chronic skin lesions, or (b) from some type of chronic "rheumatism" The method employed involves only routine bacteriological methods The results, therefore, are not open to criticism on the ground of difficulty of technique and "the personal equation," and may be put forward as facts which can be easily verified

The utility of the method is based upon the assumption that comparatively feeble bactericidal power of a patient's blood affords presumptive evidence of considerable weight that infection is present, when other circumstances point to such a conclusion; but if evidence of comparatively efficient bactericidal power is obtained, this would appear definitely to exclude infection in face of merely theoretical or speculative opinions to the contrary.

DETAILS OF THE METHOD

The main difficulty at the outset was to find the quantity of a patient's faecal material which, when introduced into a given quantity of his own blood, would prove suitable for differentiating one patient from another as regards bactericidal efficiency If an excess of faecal material is added, all bloods tend to yield positive cultures, if too little is added, too many

negatives will result. In practice I have found the following procedure the most convenient —

A gram of the patient's liquid fæces is emulsified in 100 c cm. of sterile water, 1 c cm of this emulsion is added to another 100 c.cm. of sterile water; 1 c.cm. of this diluted emulsion is further diluted with 3 c.cm. of a 1 5 per cent sterile saline solution. In this way the working fæcal emulsion is obtained. Considerable preliminary work was required to ascertain the fact that a measurable quantity of this dilution of liquid fæces would, with 2 c cm of blood, permit of some estimate of comparative bactericidal efficiency.

Five sterile test tubes, which are numbered 1 to 5, and three reagents are required in the test as hitherto evolved. The reagents are the patient's fæcal emulsion, the patient's blood, and a sterile solution of sodium citrate (1 5 per cent.) and sodium chloride (1 per cent). If for convenience these reagents are designated FE, B, and S, the final arrangement of the test may be exhibited at a glance. —

Test Tubes	No 1	No 2	No 3	No 4	No 5
Add (1)	0 1 c cm FE	0 1 c cm. FE	0 3 c.cm FE	0 9 c cm FE	0 0 c cm. FE
Add (2)	—	—	—	3 c cm. S	3 c cm S
Add (3)	2 c cm B	2 c cm. B	2 c cm B	2 c cm. B	2 c cm. B

The tubes are at once well shaken before clotting occurs and transferred to the incubator for 24 to 36 hours. At the end of this time 0 1 c cm of serum is taken from each of the tubes numbered 1 to 3 and distributed over agar slopes. These subcultures are then incubated for 24 to 48 hours and the results noted. (I may say, however, that tube No. 2 was only added six months ago. It and the subculture from it are incubated under comparatively anaerobic conditions. The numbers dealt with are therefore too few to permit of a useful survey and are consequently excluded from the purview of this paper. The function of each of the other tubes will be obvious.)

The results may be indicated in tabular form as

follows.—

	No 1	No 3	No 4	No 5
Sterile	34%	15%	—	—
Gram positive cocci only	31%	—	—	—
Gram negative bacilli only	13%	—	—	—
Gram-negative bacilli and Gram positive cocci	16%	—	Hæmolyasis 7%	0
Gram negative bacilli and Gram positive bacilli	6%	—	Coagulation 9%	0

When the subcultures consisted of Gram-positive cocci only, the colonies had the naked-eye appearance of staphylococcal colonies. Indeed, a very surprising result has been failure to find streptococci in the subcultures in any case so far investigated. No doubt enterococci (diplococci) were sometimes present among the staphylococci, but they were not recognizable in the films. It may be added that streptococci (long or short chains) were especially looked for in several cases in which films from the fæces showed streptococci in considerable numbers and in comparatively long chains. One would infer that streptococci observed in fæcal films have sometimes been credited incorrectly with pathogenic achievements. Or, on the other hand, these streptococci may have been relevantly pathogenic but anaerobic. Considerations of this kind led, as has been mentioned, to the addition of No 2 tube and explain its necessity. The importance of this aspect of intestinal infection is accentuated by Colebrook's⁴ recent observations in connection with puerperal fever. It was rather surprising to find hæmolysis in the presence of intestinal toxins so rare, if one takes 48 hours as the time limit for its production. Coagulation was, in all but one instance, coincident with an apparently pure growth of staphylococci in No 1 tube. In these cases pruritus was a prominent clinical feature.

Without going into details at any length, a few points of interest may be mentioned. Staphylococci were present in the skin lesions of all patients whose No 1 tube yielded an apparently pure culture of staphylococci. In a very intractable case of erythema

with recurring febrile attacks the subculture from No. 1 tube showed a Gram-positive coccus and a Gram-negative bacillus; a culture from this patient's urine also yielded a coccus and a bacillus which morphologically and in their staining reactions were indistinguishable from those in the subculture. The cases in which an apparently pure culture of Gram-negative bacilli in No. 1 tube was found might all be included in the group described as erythema multiforme, and one of these—a case of erythema iris—seemed to be influenced very favourably by an autogenous vaccine prepared from the subculture. With regard to the cases of chronic "rheumatism" dealt with, several of the patients suffering from infective arthritis responded in a very gratifying way to treatment by autogenous vaccines prepared from the subcultures, but the cases of clinical rheumatoid arthritis were disappointing. As an illustration of the former group, one case may be cited briefly —

A girl, aged 15, had a severe attack of rheumatic fever with endocarditis, satisfactory recovery, well for four years, then began to complain of pain and stiffness in various joints, occasional swelling, some creaking, no fever. This condition persisted for about nine months under routine treatment.

This method was then tried and a vaccine prepared from subculture. After the first few inoculations she reported that she "felt a lot better." Treatment discontinued over a year ago. She has remained quite free from joint symptoms to the present time. Radiostoleum capsules were also given.

It was found desirable to examine two patients together, partly to economize time and partly to obtain sharply contrasting results, such results were obtained on several occasions. Statistics usually fail to leave a very vivid impression, but the contrast between one blood which gave a negative result in all tubes and the other which gave a profuse growth in No. 1 and No. 3, and hæmolysis with coagulation in No. 4, was even more impressive than the contrast between a negative and a strongly positive Wassermann reaction. One cannot doubt the significance of such a

contrast in two patients suffering from "eczema," and that it points the way to a more useful classification than is possible from external appearances alone. Nomenclature counts for too much in dermatology, underlying causes demand more attention

Though this method does not afford *conclusive* evidence of intestinal infection, I think it might be employed with an expectation of establishing a *significant correlation* between certain intestinal microbes and certain types of skin and joint lesions eventually. Someone may ask what advantage that would be, and one may point out the following: (1) we should then have some exact and relevant knowledge, where now we have little besides speculation. Celsus said two thousand years ago that "Medicine is a conjectural Art." Matters have improved in the last fifty or sixty years, but it is certainly true that there has been little beyond mere conjecture hitherto in connection with the immediate problems under consideration, (2) a *significant correlation*, superseding conjecture, would doubtless lead to a more general scrutiny of the means at our disposal for modifying the intestinal flora, reinforcing the resisting power or achieving desensitization of patients hypersensitive to their intestinal bacteria or toxins—a by no means inconsiderable group

In the meantime the method provides material in certain cases which is presumably more appropriate for the preparation of autogenous vaccines than material selected solely on speculative grounds. *A priori* expectations, however, are not always realized, and I shall not attempt to assess the value of the method at present. But one interesting feature of the vaccines prepared in this way may be mentioned: hypersensitiveness to very minute doses was encountered with quite unusual frequency in my experience. In a case of lupus erythematosus, for example, one two-thousandth of what would be an average dose

caused undoubted aggravation of the local discomfort. In another case of exceptionally irritable and intractable eczema, Dr. J. Walker (Preston) writes to me: "The hypersensitiveness had been overcome to some extent when the inoculations were discontinued. I think the patient's continued immunity from further attacks of the eruption is due to the cumulative effect of the prolonged vaccine treatment." He further expresses the opinion that "the nature of the reactions indicates that we were definitely dealing with the causative agent." That is also my own impression. It is a question, however, of obvious practical interest whether desensitization should be attempted by a prolonged series of very small doses or by a few comparatively large doses. In favour of the latter procedure is the experimental fact that a guinea-pig sensitized to a foreign protein, when given a large intravenous injection of the same protein, usually becomes refractory to another dose, if a fatal issue is averted. Of course, in these patients hypersensitive to intestinal bacteria or toxins, the condition is rather one of allergy than anaphylaxis, and, though there may be temporary inconvenience, there is, I think, no danger from a comparatively large subcutaneous dose.

The best method of desensitization, however, depending as it does on the interval between as well as on the size of the doses, must for the present be left to individual discretion and experience. An occasional dramatic result settles nothing. But if hospital physicians generally relied more on observation of groups, other groups under routine treatment alone acting as controls, and less on individual "clinical impressions," I think we should arrive more quickly at sound conclusions and in time be relieved from a good deal of the therapeutic conjecture still so prevalent.

In conclusion, may I suggest that what we call "health" is not a condition of equilibrium in which our resistance is at such a level as to afford steady

security against microbial invasion? It is rather a condition of oscillating equilibrium, the oscillations above or below the mean level being determined by a variety of factors, such as heat, cold, sunshine, fatigue and nutrition. From this standpoint the hypothesis of "showers of microbes" into the lymph or blood stream seems to provide an attractive explanation of transient febriculae and perhaps of many even slighter ailments. The shower may be only a few drops or a deluge, and the result—a persistent septicaemia, localization of the infection, or possibly an almost immediate *restitutio ad integrum*.

My thanks are due to Dr. Lancashire, Senior Physician to the Manchester and Salford Skin Hospital, for the majority of the dermatological cases dealt with in this paper.

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The Use of Artificial Pneumothorax in the Treatment of Pleurisy in Pneumonia

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THE employment of artificial pneumothorax in the treatment of pleurisy occurring in pneumonia is an attempt to reduce the mortality of one of the commonest and most fatal diseases that affect man, by relieving perhaps the most distressing symptom of the disease and thereby obtaining a more nearly optimum state in which the patient may resist and subdue the infection. It is agreed that the first and most important step in the treatment of a case of pneumonia is rest, in the fullest sense of the word—mental, bodily, and respiratory—and the chief feature of pleurisy is that the possibility of rest is almost entirely precluded by pain with each respiration, sharp and lancinating, stabbing through the patient's body, more intense on coughing and at the end of a deep inspiration.

The causation of the pain has been the subject of some discussion of recent years and has some relation to the treatment. For a long time it was thought that the rubbing of the inflamed layers of parietal and visceral pleura on each other caused the pain by irritating the nerve endings, and this view is supported by the presence of friction sounds over the site of the pleurisy and the relief of the pain when effusion supervenes. This is known as the friction theory; more recently Mackenzie¹ suggested the muscular

tions of pain in the first group are referred to the neck, particularly along the borders of the trapezi and, according to Zachary Cope,⁶ very frequently also in the infraclavicular fossa, through the descending cutaneous cervical nerves, which have a common origin with the phrenic nerve. Pain sensations from the periphery of the diaphragm, on the other hand, are referred to the lower thorax, the lumbar region, and the abdomen, and the localization of the exact position of the pain is usually vague.

Turning now to the practical side of the problem, the presence of pleurisy concurrently with pneumonia makes much more difficult the effective treatment of the lung condition. The patient is unable to take steady easy inspirations, for, just as he is filling his lungs, he is stabbed by a pang of pain. In the same way, instead of lying as restfully as may be, he turns and tosses in bed, constantly distressed and persistently awake. The physician is frequently forced to the use of some opium preparation to relieve this pain, in spite of the contra-indication by lung disease to that drug. Strapping the side of the chest, the usual and simple remedy for dry pleurisy, is quite out of the question in the presence of pneumonia, counter-irritants, such as leeches and pigments, are occasionally satisfactory, but are unreliable and not always effective. Poultices and similar applications should be avoided as restricting the respiratory excursion when the freest movement is vital. This painful symptom can, however, be at once and easily relieved by the injection of oxygen into the pleural cavity. The method was advocated by Morrison Davies for the treatment of dry pleurisy, and was first used by Professor W. H. Wynn⁷ in cases of pneumonia. My own experience has been obtained with patients in Professor Wynn's wards. In this procedure a small quantity of oxygen is introduced into the pleural cavity, sufficient only to separate the layers without

appreciably collapsing the lung. The method used is the same as for any other artificial pneumothorax, except that the needle should be inserted where the pleurisy is most marked as evidenced by the loudest friction sounds and greatest pain. The use of a local anæsthetic is a *sine qua non*, as the inflamed state of the pleura makes it considerably more sensitive, and it is very desirable to avoid disturbing the patient more than necessary. Two per cent novocain is therefore injected into the skin, chest wall, and especially the pleura, which latter minimizes the pain and the possibility of pleural reflex. A Riviere trocar and cannula are used for the induction. They are kept in alcohol, which is carefully burnt off before use, as it is essential that the lumen should not be occluded in any way and thereby impair the free flow of gas. The side tube of the cannula is connected to a graduated cylinder containing oxygen, which is forced through by running water into the bottom from another bottle. A manometer, attached by a T-piece between the cylinder and cannula, records the gas pressure in the cannula and in the chest. The trocar and cannula are pushed through the prepared and anæsthetized skin at the selected spot and the trocar is removed. The cannula is then forced onwards to the pleura, which gives suddenly, with a snap that is often audible. If the pleural surfaces are not adherent the manometer at once shows a negative pressure of 8 to 12 cm. of water, fluctuating 4 to 8 cm. with each respiration. No oxygen must be allowed to enter until this fluctuation of negative pressure is obtained, indicating that the pleural space has been reached. The introduction of about 250 to 500 c cm. of oxygen is usually enough, this only slightly affects the intrapleural pressure, e.g. from -18 , -12 cm. of water-pressure, 400 c cm. of oxygen made it -14 , $+4$ cm. of water; in another case, -12 , -8 cm. of water became -4 , $+3$ cm. of water with 400 c cm. of oxygen; and by radiography

it is shown that it barely affects the volume of the lung.

As regards results, the pain is typically relieved almost completely, the relief appearing as the end of the induction is reached. Generally complete relief is obtained some minutes later, when the patient can settle down again, and it is then noticed that the respirations are slower and more regular, and he readily falls asleep. The pulse-rate nearly always slows by twenty or more beats per minute, and a corresponding improvement in the general condition is evident. The pneumothorax will last in most cases about three or four days, maintaining its effect, but a tympanitic note and diminished breath-sounds persist for several days. After a few days friction sounds often return, but as a rule are not accompanied by pleuritic pain. If, however, pain does recur, it is quite simple to refill the pneumothorax.

The best results obtained have been with pleurisy in the lower axillary region, where the ribs are well apart and the respiratory movement is greatest. This site is one of the commonest for pleurisy and is one of the easiest for inducing a pneumothorax. The following case is an example of this type:—

The patient, E. B., was a girl aged 21, who had had two attacks of influenza, a month and a fortnight, before admission to hospital. Three days before coming in she was seized with a bad stabbing pain at the base of the left chest, occurring with each breath. Cough and fever occurred concurrently. On admission on March 3, 1929, to the General Hospital, Birmingham, she had a temperature of 104° , a pulse-rate of 128, and respirations of 44 per minute. Her blood-pressure was 133/85 mm. of mercury, and she lay in bed obviously ill, but restlessly jumping about and taking only small, irregular, evidently painful, convulsive breaths, the pain of which was accentuated by coughing. The physical signs showed an area of pneumonia in the left lower lobe with a well-marked definite dry pleurisy in the axillary line about the level of the sixth and seventh ribs on the left side.

She was watched for six hours and received the usual routine treatment, but showed no signs of settling down or becoming comfortable, so at 10 p.m. 400 c.c. of oxygen were introduced into the pleural cavity at the point where the loudest friction sounds were heard. The pressures at the beginning were — 12, — 8 cm.

of water, and became $-4, +3$ cm of water. At the same time 200 millions each of a stock vaccine of pneumococci, streptococci and influenza bacilli were injected. Within half an hour of completing the pneumothorax the patient was quietly sleeping, she did not wake till 6 a.m., and she had her crisis during that day, the fifth day of the disease.

In the next case the pleurisy was higher in the chest and nearer the front. In this situation an artificial pneumothorax is more difficult to induce and the pleural layers do not separate so readily. Relief from severe pain was, however, quickly obtained, and improvement in the pulse and blood-pressure were noted.

The patient, J. B., a youth aged 25, was admitted to hospital on March 1, 1929, on the fifth day of an illness consisting of malaise, cough, fever, and pain in the right side of the chest. He lay on his back obviously ill, flushed, sweating, and with herpes. The temperature was 103.6° , pulse-rate 112 per minute, and respirations 30 per minute. He had a short, sharp, hard cough, which he tried to suppress owing to the pain. Examination showed a consolidation of the right middle and lower lobes, and friction sounds were heard in the anterior axillary line over the third rib.

An artificial pneumothorax was induced on the right side, the needle being introduced in the mid-axillary line in the fourth intercostal space. 500 c.c. of oxygen were run in, changing the pressure from $-20, -16$, to $-10, -2$ cm of water. As a result, in half an hour the pain and cough were almost entirely relieved and the patient was comfortable again after being severely distressed. His temperature fell by lysis on the eighth and ninth days and he made an uneventful recovery.

The third case was one of the most severe forms of pneumonia, causing persistent diaphragmatic pleurisy with intense pain.—

The patient, S. W., a woman aged 30, was admitted on the first day of the disease, June 27, 1929, with a temperature of 104° , a pulse-rate of 124, and respirations of 30 per minute, prostrated by acute pain in the right side of the chest, low down, and in the back. Signs of pneumonia were found with consolidation of the right lower lobe, but no friction was heard. A persistent, painful, distressing cough was very trying, and almost continuous pain at the right costal margin and in the right loin and back, evidently diaphragmatic in origin, prevented any prolonged rest.

For six days the patient was treated on orthodox lines, but failed to respond. On March 3, in view of the persistent pain and progressive deterioration, Professor Wynn induced an artificial pneumothorax on the right side, introducing the needle in the posterior axillary line in the sixth intercostal space. 500 c.c. of

oxygen were run in and the foot of the bed was raised 12 in

Very rapidly relief was obtained, the pain disappeared, the cough was eased, and the patient went to sleep. Her pulse dropped from 144 to 128 per minute and her breathing was much easier. Crisis occurred on the following day and recovery followed in due course, except for an interruption caused by an attack of acute pyelitis

In this case the pleurisy was evidently situated posteriorly on the diaphragm in the area supplied by the intercostal nerves. The raising of the foot of the bed enabled the oxygen to run up to the base and separate the pleural surfaces, the lung tending to sink towards the neck. Radiograms in this case showed the pneumothorax distinctly as a thin layer near the base four days after the induction, but it was no longer recognizable after ten days. No recurrence of pain was noted as the oxygen was absorbed

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The Wisdom Tooth and Associated Troubles

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DURING the past decade, much has been written of the connection between dental sepsis and systemic disease, and it is unnecessary to emphasize the importance of such well-recognized facts, but other dental conditions give rise to general symptoms, and it is of these that this short note is written.

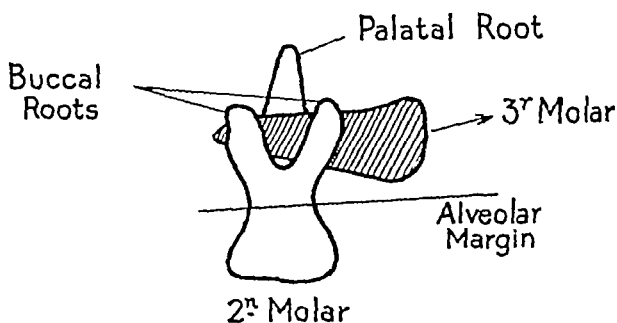
It is not uncommon for third molar teeth to develop in an abnormal position, i e horizontally or obliquely, and, when such is the case, there is a tendency for them to press upon the next tooth (the second molar). In such circumstances, any, or a number, of the following conditions may arise—neuralgia, persistent headache, stiffness or neuritic pains in the neck and shoulders, earache, ocular symptoms, general malaise, neurasthenia, fits, and even mild forms of mania. Most of the recognized textbooks on dental pathology mention such symptoms as possibilities, without, however, giving further details, and the view is mostly taken that some septic condition is necessarily present, in addition to the impaction.

I consider the following case of sufficient interest to merit publication, as the symptoms appear to have been entirely due to the pressure of the impacted wisdom, without any accompanying dental sepsis.—

Mrs X, aged forty, was sent to me for X-ray examination of her teeth, in the hope that some abnormality might be found to account for her obscure and varied symptoms. For about eighteen months she had not been "feeling well," and, during the same time, suffered from mild neurasthenia, chiefly characterized by irritability over trifles, a condition quite foreign to her nature. Recurrent headaches, getting rather more severe during the past

month, and vague neuralgic spasms in the left side of the face increased the neurasthenic symptoms. The eyes became "tired" after reading for an hour or so, but a careful ophthalmic examination did not reveal any errors of refraction or other abnormality. Weak reading glasses were recommended, and tried, but without relief. The final and most troublesome symptom, of about a month's standing, was an acute pain in the left shoulder and upper arm, aggravated by any upward movement of the arm to such an extent that she could not "do her hair." Radiant heat, etc., had given no relief.

An X-ray examination of the teeth showed that there were no apical abscesses, nor periodontal infection, and that the only abnormality was an impacted upper third molar. This tooth was lying horizontally, with the apex forward, and was impacted, the root lying between the palatal and buccal roots of the second molar.



(see diagram) It was decided to relieve the impaction by extracting the second molar, not a practice to be generally advised, but the third molar was lying high, and its extraction would have entailed a rather extensive operation, to which the patient was very averse. This was done, and it was found that the impaction was so extreme that there was some actual erosion of the buccal roots on the lingual aspect, owing to the pressure from the root of the wisdom tooth. Forty eight hours after the extraction, the pain in the shoulder and arm had completely gone, and now, some four months after, the neurasthenia and malaise have disappeared, the headaches and neuralgia have gone, and the eye symptoms have much improved. Mrs. X. now says that she is "feeling very well."

I am indebted to Mr. C. J. Tisdall, L.D.S., for the information regarding the condition of the second molar.

Impacted wisdom teeth are certainly the worst offenders, but other impacted teeth may cause somewhat similar conditions, and, if no other cause can be elicited, an X-ray examination may often clear up difficulties in diagnosis.

Tuberculosis and Goats' Milk

BY R I PITT, L F P S G, L S A

I READ with interest the article on cows' milk by Lord Moynihan in the April, 1931, number of THE PRACTITIONER. The supply of pure milk is of the greatest importance to the general community and more especially to children, who in early infancy depend upon milk in some form for their entire sustenance. The article referred to treats entirely of cows' milk. I wish to bring to the notice of practitioners the value of goats' milk, which I think, up to the present, has not received the attention from the profession which it merits.

The properties of goats' milk compared with cows' milk give it a distinct advantage. In the first place goats are not subject to tuberculosis, so their milk is free from suspicion of that taint. As milk is derived from the blood of the animal secreting it, it is obvious that the immunity possessed should be transmitted through the milk, and that the immunity is due to some special immunizing property which accounts for its beneficial effects when supplied to tuberculous children, who are therefore taking milk not only free from the tubercle bacillus, but also possessing special immunizing properties. It is generally known that goats' milk is more digestible than cows' milk, and that children fed with it never vomit hard curds as they do when given cows' milk, but what they bring up is of a flocculent nature like the vomit of a child fed upon the breast. The nutritive value of goats' milk as demonstrated by analysis is quite equal to, and in many cases of well-fed goats superior to, that of cows. Its digestibility is demonstrated beyond argument when supplied to delicate and weakly

children. In my own experience I have known several weakly children who were unable to digest cows' milk thrive when supplied with that taken from a goat, and in the case of three premature babies (one only three and a half pounds at birth) grow up to be healthy children. From the above facts I think the goat should be more generally used as a milk supply in rural districts and especially at sanatoria, where the more able patients could be employed in looking after them, gaining experience in the management of animals and the benefit of a healthy occupation.

There is much prejudice against the use of goats' milk, which to a great extent is due to the prevailing impression that all goats have a disagreeable odour attached to them, this is quite erroneous, the female is absolutely free from any disagreeable smell, which only belongs to the male. This delusion is being combated by the British Goat Society and affiliated societies by instituting goat shows and supplying milk to the public, as is done at the British Dairy Farmers' Society exhibition, where goats' milk is supplied and is much appreciated. In my own house, people who declared they could not touch goats' milk were agreeably surprised to find how much it improved both tea and coffee and was free from any disagreeable flavour.

Goats are liable to infection by parasites, as are sheep and cows, and also to undulant fever (*Brucella abortus*), a microscopic infection which has been proved to be transmitted through the medium of cows' milk, so the goat cannot be considered the sole carrier of this disease.

Government has recognized the importance of this subject, and has granted financial assistance and advice by the Minister of Agriculture and Fisheries through the British Goat Society, by whom so much good work has been done in improving the breeds of goats by selection of the best types to breed from, and

has so much improved them that their period of lactation is now considerably prolonged, and the best goats now give considerably over a gallon of milk in 24 hours, some as much as a gallon and a half; the ordinary wayside or common goat gives from three pints to two quarts or a little over in the 24 hours. Several goat societies now affiliated with the British Goat Society are carrying on the good work and helping cottagers to acquire goats in order that their families may be supplied with pure milk, of which many are in great need and unable to procure. As a goat is so easily and economically kept by a cottager in country districts, it is surprising this source of milk supply is not more often resorted to by them.

As I have stated above, the immunity of goats from tuberculosis specially fits them for supplying milk to sanatoria patients, and perhaps the British Goat Society and its affiliated members might be induced to supply a small herd to some sanatorium. Perhaps Papworth might be considered a suitable place to begin with. There they have plenty of space, are training patients in several industries and would no doubt have no difficulty in training some to attend to the goats, which would provide an interesting outdoor occupation. They have the open spaces there, and in the village many children of patients, and both children and parents would be greatly benefited by the use of goats' milk.

Practical Notes

The Treatment of Fibroids of the Uterus

H H Schlink and C L Chapman consider that in the case of most fibroids of the uterus treatment should be surgical. They believe in (1) The vaginal removal of most pedunculated sub-mucous fibroids, (2) Myomectomy in selected fertile cases, (3) Total hysterectomy for certain cervical fibroids or cases complicated with malignant disease, (4) Porro's hysterectomy following Caesarean section in certain cases of fibroids complicating pregnancy, (5) Sub-total hysterectomy with endocervical enucleation for all other cases. Radiotherapy should only be used (1) In cases in which the tumours are relatively small and uncomplicated by degeneration or diseased appendages, cases, that is, in which the symptoms closely simulate the myopathic uterus (chronic metritis) by causing the postponement of the menopause with severe bleeding after forty, (2) In cases of uncomplicated fibroids requiring treatment, but in which considerations of general health contra-indicate operation, for example, cardiac and renal disease, Graves's disease, diabetes, pulmonary tuberculosis and other respiratory complications and, finally, dread of operation, (3) As an alternative to blood transfusion in cases of profound secondary anæmia to render the patient fit to stand radical curative measures — (*Medical Journal of Australia*, June 6, 1931, xviii, 1, 691)

The Action of Irradiated Ergosterol and its Relationship to Parathyroid Function

N B Taylor and C B Weld with H D Bramon and H D Kay have carried out at the University of Toronto a number of experiments from which fresh evidence has been derived for a close relationship between the overdosage effects of irradiated ergosterol and parathyroid function. This relationship is thought to be most probably a direct one, namely, the stimulation of parathyroid tissue by the sterol. Death of adult dogs follows the administration of irradiated ergosterol when the amount given per kilo has a greater potency than 20 times that of the maximal therapeutic dose. Puppies show a greater susceptibility to overdosage than full-grown animals. The symptoms and post mortem findings in the blood following overdosage with irradiated ergosterol are indistinguishable from those resulting from the administration of lethal doses of parathormone. The chemistry of the blood, in so far as this has been investigated, is affected in an almost identical manner by either substance. The effects of excessive doses of irradiated ergosterol upon calcium and phosphorus metabolism run closely parallel with those resulting from parathyroid overdosage. It is pointed out that those species which show a high resistance to the toxic action of irradiated ergosterol are tolerant to a corresponding degree to the action of parathormone. Since the dog and the human subject are, as contrasted with other species, highly susceptible to

the hormone, it is suggested that the human subject may share with the dog a high susceptibility to irradiated ergosterol. Clinical observations are cited as direct evidence for the latter view. The authors' experiments and those of others indicate that, upon increasing the dosage of irradiated ergosterol from small to very large amounts, its effect upon calcium metabolism becomes reversed, a parathormone-like action becoming manifest. The precise level of dosage at which the reversal of action occurs is unknown—(*Canadian Medical Association Journal*, July, 1931, xxv, 20)

The Treatment of Derangement of the Cartilages of the Knee-joint

L. A. Lantzounis publishes a report on a study of end-results in 142 cases of derangement of the cartilages of the knee-joint treated by operation. He states that an untorn, hypermobile meniscus is a definite entity. A deranged meniscus may occur in an arthritic joint or may be the inciting cause of arthritis on account of the constant mechanical irritation. The presence of arthritis in a knee joint, complicated by a deranged meniscus, does not constitute a contra-indication for operation, and the symptoms may be greatly relieved by removal of the meniscus. Removal of one or both menisci does not result in an unstable knee joint. The removal of an offending meniscus by operation is a better procedure than any prolonged conservative method of treatment. The relief of symptoms in uncomplicated traumatic lesions of menisci is uniformly complete following removal of the meniscus—(*Surgery, Gynecology and Obstetrics*, August, 1931, lxi, 182)

Pantocain, a New Local Anæsthetic.

Lundy and Essex, of the Division of Experimental Surgery and Pathology, The Mayo Clinic, have made experimental and clinical observations on pantocain (butylamino-benzoic acid B dimethyl-amino-ethylectermonohydrochloride) which chemically and clinically resembles procain, but is effective in a dose of one-fifth to one-tenth and produces an anæsthesia two or three times longer. For spinal anæsthesia one milligramme of pantocain for each 10 lbs. of body weight, plus 5 mg., is the dose for adults, a 0.5 per cent. solution being employed. In order to support the blood-pressure during spinal anæsthesia intramuscular injection of 25 to 50 mg. of ephedrine has been shown to be useful. Pantocain is best adapted for operations to cure ventral hernia and gastro-jejunal ulcer, in resection of the stomach and lumbar sympathetic gangliosectomy. It has been found to be three or four times less toxic than nupercain, a derivative of quinine (α -butylaxycinchoninic acid diethyl-ester diamide hydrochloride), as a spinal anæsthetic—(*Staff Meetings of The Mayo Clinic*, June 24, 1931, vi, 376)

Atony of the Gall-Bladder.

In an article on black bile condition of cholecystatony

el, and Amy
muscular

gall-bladder, although there is not any mechanical obstruction, becomes distended with bile, which from over-concentration becomes very dark and contains an excess of biliary pigments, bile acids and cholesterol. Associated with this condition of the bile in the gall-bladder there are the following symptoms: digestive vagotonia, biliary dyspepsia, and often a special form of migraine. The existence of the gall-bladder condition can be shown by cholecystography, as, indeed, Graham, Cole, Copher, and Moore have demonstrated, and by Lyon's method of medical drainage of the biliary tract. This condition of biliary stasis and the attendant symptoms can be benefited by Lyon's medical drainage, and the operation of temporary cholecystotomy is not necessary—(*Presse médicale*, July 4, 1931, 988)

The Value of Skin Tests and Immunization against Scarlet Fever and Diphtheria.

P. S. Rhoades carried out skin tests and immunization against scarlet fever and diphtheria among the nurses of Cook County Hospital, Chicago, with the following results. The Dick test proved to be a reliable indicator of immunity to scarlet fever. No cases developed among 533 nurses found immune on original tests, while fifteen cases occurred during the same period among 449 nurses who either were Dick positive or were neither tested nor immunized. Immunization with five doses of scarlet fever toxin of 500, 2,000, 8,000, 25,000 and 80,000 skin test doses respectively was successful. No cases of scarlet fever occurred among 298 nurses who received the full series of immunizing doses, while there were fourteen cases during the same period among 449 nurses who received no immunizing doses from the Scarlet Fever Committee and one case in a nurse who had received three doses but had not had her fourth and fifth immunizing doses. Among the 190 nurses immunized against scarlet fever, the total loss of time due to reactions from the immunizing doses was 45.5 days, an average of 0.239 day per nurse.

The results of immunization against diphtheria with five doses of toxin-antitoxin of tested potency and with diphtheria toxoid followed by retests and more doses when indicated were distinctly better than those previously reported when only three doses of toxin-antitoxin were used. Three cases of diphtheria occurred among 141 nurses who received five or more doses of diphtheria toxin-antitoxin of tested toxicity. One case of diphtheria occurred in a group of 424 nurses who received a full series of doses (totaling 2.5 c cm or more) of diphtheria toxoid. During the same period there were eighteen cases of diphtheria among 550 nurses with identical exposures who were either not immunized at all or who received less than the full series of diphtheria toxin-antitoxin or toxoid. Two cases of diphtheria occurred among 165 nurses who had negative original Schick tests. It is probable that an impotent preparation of Schick test toxin was used for these tests. Nine preparations of Schick test material were tested simultaneously. Two commercial preparations gave negative results in all persons tested, while all the others gave positive results in the same persons.

Complete series of diphtheria toxoid (totaling 2.5 c cm or more)

immunized 81.4 per cent of the nurses to the point of a negative Schick test, while five doses of a preparation of toxin-antitoxin of tested toxicity (totalling 4.5 c.c.m.) used in a similar group immunized 64.4 per cent to this point. Three hundred and sixty-one nurses who received diphtheria toxoid lost a total of forty-eight days from duty because of reactions, an average of 0.133 day per nurse —(*Journal of the American Medical Association*, July 18, 1931, xcvi, 153)

Bovine Tuberculosis in Man

This memorandum on bovine tuberculosis in man with special reference to infection by milk shows that, although it is not possible to give the proportion of the cases of bovine tuberculosis in man, probably more than a thousand deaths under the age of 15 years in England and Wales are annually due to this infection, and for some forms of tuberculosis, namely, lupus and cervical adenitis, half the cases at all ages are due to bovine infection. It is, of course, practically certain that the great majority of human infections with the bovine tubercle bacillus are due to milk, and there is reason to believe that the proportion of milch cows in this country actually yielding tuberculous milk is probably between 1 and 2 per cent. Complete eradication by means of universal tubercular testing and the slaughter of all the reacting animals is not practicable in this country, but a less drastic procedure aiming at the destruction of animals in an advanced and more infectious stage is represented by an order of the Ministry of Agriculture and Fisheries, 1929. Calmette and Guérin's claim to prevent tuberculosis in young calves by protecting them with their vaccine B.C.G. has not yet been established for human babies —(*Reports on Public Health and Medical Subjects*, No. 63, Ministry of Health, 1931, pp. 25, price 6d.)

Carcinoma of the Naso-pharynx

Digby, Thomas, and Hsiu analysed 103 cases of carcinoma of the naso-pharynx seen in the Surgical Unit, University of Hongkong, since 1914. The disease is much commoner in China than in Great Britain, it attacks males three times more often than females, and is most frequent comparatively early in life, 31–35 years. It appears in various guises and is often diagnosed wrongly in its early stages, most commonly it presents the picture of enlarged upper deep cervical glands on both sides, though those on one side are usually affected before those on the other. Some cases have probably been regarded as lympho-sarcomatous, tuberculous, or syphilitic involvement of the gland in the neck. The tumour is an atypical spheroidal-celled carcinoma, which, besides spreading to the lymphatic glands, may invade the orbit, causing proptosis, or the skull, involving various cranial nerves and producing strabismus, blindness, paralysis, muscular atrophy, severe pain, deafness, and tinnitus. The primary growth, which, of course, should be removed as soon as possible, may, unfortunately, be very inconspicuous for a long time, and, being merely a fissure or an induration, may be missed when examination with an ordinary nasopharyngoscope is carried out.

An attempt to provide a more satisfactory form of instrument is being made by the authors—(*The Caduceus*, Hongkong, May, 1930, ix)

The Nature of the Toxic Agent in Eclampsia and the Nephrosis of Pregnancy

F Hoffmann and K Anselmino have brought forward clinical and experimental evidence to support their contention that the substance in the blood of pregnant women suffering from eclampsia or nephrosis is identical with the hormones secreted by the posterior lobe of the pituitary. Filtrates from the blood of women with either of these two dreaded complications of pregnancy, when injected subcutaneously into rabbits, greatly diminished the amount of urine subsequently secreted. In those cases in which the blood pressure of the patient was considerably raised, injection of the filtrate from the blood produced an appreciable rise also in the blood pressure of animals. Similar injections from cases of uncomplicated pregnancy or from non-pregnant women had no effect on the blood pressure of rabbits. From the results of their experiments Hoffmann and Anselmino submit that the primary factor in the production of eclampsia and the nephrosis of pregnancy is a disturbance of the organs of internal secretion which leads to an uncompensated overproduction of both the anti-diuretic and vaso-compressor components of the hormone of the posterior lobe of the pituitary body—(*Klinische Wochenschrift*, August 1, 1931, 1438)

The Incidence of Cancer of the Urinary Bladder and Prostate in Certain Occupations

S A Henry, N M Kennaway and E L Kennaway find from examination of 12,403 death certificates from England and Wales during the period 1921-1928, both included, that 5,621 men died from vesical cancer, 974 from papilloma of the bladder, and 5,808 from malignant disease of the prostate. Analysis of the cases from 46 occupations shows that in eight out of the ten occupations associated with exposure to coal gas, tar, pitch or soot the incidence of cancer of the bladder is greater than that found in the general population, and that tar distillers, gas-works engine and crane drivers, and patent-fuel labourers have the highest incidence, of these three occupations the tar-distillery workers show a low and the patent fuel workers a fairly high incidence of prostatic cancer. A comparison of the incidence of cancer of the bladder on the one hand and of cancer of the scrotum and other parts of the skin on the other hand suggests the idea that the skin serves as a very effective first line of defence to the urinary tract, occupational cancer of the bladder is absent in shale-oil workers and sweeps who suffer from scrotal carcinoma, but the authors are careful to admit that the substances producing carcinoma of the skin may be different from those which cause cancer of the bladder. The analysis of the data about prostatic cancer gives less consistent indication of an occupational liability than in vesical malignant disease—(*Journal of Hygiene*, Cambridge, 1931, April, xxi, 125)

Reviews of Books

Recent Advances in Radiology By PETER KERLEY, M.B., Ch.B.,
D.M.R.E. London J & A Churchill, 1931 Pp viii and
324 Illustrations 120 Price 12s 6d

DR PETER KERLEY has made it his business to produce a readable book on up-to-date radiology for the general practitioner—and books on radiology that are readable so far as the general practitioner is concerned are very few—and in this intention he has certainly succeeded. He has been well seconded by his publishers, for the book is lavishly illustrated with excellent radiograms and a number of unusually clear and understandable diagrams. Not all of the sections of the book are, however, equal in merit, the section on the alimentary canal could not be better done or better illustrated, but the section on X-ray therapy is disappointing and the section on the genito-urinary tract is frankly inadequate. This last section illustrates the difficulty of producing a series of books on "recent advances," for by the time the book was published the part devoted to the genito-urinary tract had become out of date, as there is only a mere mention of intravenous pyelography. And, although the general practitioner is well catered for, the practising radiologist would have liked more space devoted to recent advances in technique, instead of being referred to original articles elsewhere. Nevertheless, the author and the publishers alike may be congratulated on this latest addition to a series unparalleled among medical publications.

Heart Disease By PAUL DUDLEY WHITE, M.D., Physician,
Massachusetts General Hospital, Boston New York The
Macmillan Co, 1931 Pp xxii and 731 Illustrations 119
Price 42s

THE enormous advance in our knowledge of the cardio-vascular system within the present century is strikingly shown in this encyclopedic review of the subject, which has a bibliography occupying more than 180 pages, and a subject index extending over 44 pages of smaller type. It is interesting to compare it with Sir Byrom Bramwell's book on "Diseases of the Heart and Thoracic Aorta," published in 1884. In addition to diseases of the heart, those of the vascular system, including the capillaries, are summarized, and aneurysm and such a rare condition as periarteritis nodosa are described. This volume is the outcome of many years' work and the examination of twelve thousand patients as well as a wide survey of the literature. It is divided into four parts: the first deals with the examination of the patient and analysis of signs and symptoms, the second, with the etiological types and causes of heart disease, the third, with organic lesions of the heart and great vessels, and the fourth, with the disorders of cardiovascular function. Angina pectoris is considered in the last part and is regarded as probably due to some, though not always the same, form of coronary change, but in addition to coronary insufficiency a high nervous constitution is invoked, for a sensitive person may have angina, though there is little morbid change, and an insensitive individual much in the way of pathological lesions.

of the human voice in all its registers and at the same time stimulating the ears by a short-wave oto-massage. In Dr Cathcart's hands this method has given very good results, 429 cases, or 64.5 per cent, having improved out of a total of 665 cases of chronic progressive deafness. Although the method is one which has not been taken up by otologists in general, Dr Cathcart's arguments for it seem overwhelming, he publishes all his cases, successful and unsuccessful, and, although he is obviously an enthusiast, his presentation of the case for the method is restrained and convincing.

The Modern Therapeutics of Internal Diseases. An Introduction to Medical Practice. By A P CAWADIAS, O B E, M D, M R C P. London: Baillière, Tindall and Cox, 1931. Pp xi and 147. Figs 3. Price 10s 6d.

THIS work deals with the philosophical aspects of treatment, and is not, as the reader of the title might imagine, an index of diseases with a description of the most up-to-date remedies. It is therefore more likely to appeal to the thoughtful practitioner than to those anxious to be put wise in a hurry about methods of cure and relief. While firmly convinced that treatment is the all-important duty of the medical man, the author regards its present practice as unsatisfactory and ascribes this failure to three causes: these are the lack of complete and synthetic knowledge of the science of medicine, the incompleteness of the usual diagnostic procedures, and the one-sidedness and blindness of the application of therapeutic agents. The first third of the volume is devoted to a critical consideration of the fundamental concepts of medical science on which the treatment of internal diseases is based, this is followed by an account of "the first phase of treatment of an individual suffering from an internal disease," namely, diagnosis, and then by the second phase—the application of remedies and the description of their actions. In a chapter on "the Modern Internist" stress is laid on the value of a classical and philosophical education, and Professor Brouardel, Dean of the Paris Faculty of Medicine, is quoted to the effect that students with an exclusively scientific or modern preparation never become such good physicians as their classical colleagues. Against specialization on diseases of one organ or system of the body Dr Cawadiaz has a good deal to say, and insists that "internal medicine is all or none." This book is the result of much thought and therefore deserves attention from those who look for advance in scientific treatment.

Recent Advances in Medicine. Clinical, Laboratory, Therapeutic. By G E BEAUMONT, D.M., F R C P, and E C DODDS, M V O, M D, Ph D. Sixth edition. Recent Advances Series. London: J and A Churchill, 1931. Pp xiv and 442. Illustrations 51. Price 12s 6d.

THE demand for this successful handbook is shown by the number of editions, nearly one a year, since it originally came out in 1924. The present edition has exactly the same number of pages as the fifth, two years ago, but has been thoroughly revised and brought up to date. In the account of the treatment of pernicious anaemia (a stomach deficiency disease) by stomach preparations it is suggested

that the relation between stomach extract on the one hand and liver extract on the other, is that the stomach manufactures a substance which passes to the liver to be stored there and to a lesser extent in the spleen and kidneys. Other additions deal with basal metabolism and the Aschheim-Zondek test for the detection of early pregnancy.

The Note-book of Edward Jenner, with an Introduction on Jenner's Work as a Naturalist By F. DAWTREY DREWITT, M.D., F.R.C.P. Oxford University Press, 1931. Pp. vii and 49. Plate 1. Price 3s. 6d.

THIS note-book, presented to the Royal College of Physicians of London in 1888, is now published for the first time in a very charming setting, both of the type and of the introduction by a true nature-lover. Jenner had few of the common ambitions, but showed "the generosity of a good man and the simplicity of a great one." As a naturalist his fame mainly depends on careful observation of the immoral lives of the cuckoo, mother and offspring, the mother is capable of laying twenty six eggs in one season, and each female cuckoo haunts more or less the same kind of victim, and her eggs resemble those of her victim, except in the case of the hedge-sparrow. Jenner showed that the young cuckoo and not the parent removes the eggs from the nest in which they were deposited. He also investigated distemper in dogs, and recorded many instances of hydatid disease in animals.

Recollections of an Old and Observant Practitioner By JOSEPH DANIEL McFEELY, F.R.C.S.I., J.P. London: E. O. Beck, 1931. Pp. 246. Plate 1. Price 7s. 6d.

IN the account of his "life and its warnings" the author tells a number of good stories and strange adventures as a general practitioner in various Irish villages and in Liverpool, and, between these two periods, as senior surgeon to Mercer's Hospital, Dublin, for seven years. The Ireland he describes is very different from that of the present day. This autobiography occupies half the volume. It is often regretted that the information, diagnostic and therapeutic, obtained by general practitioners as the result of long experience all too frequently dies with them. In the second part of this volume the author breaks such a silence, and reverts to the method he described in 1902 of applying formalin to superficial malignant growths and thereby leading to disintegration of the neoplastic cells. There are a number of other remedies in which he had great faith, such as salicylate of sodium, as a specific for tuberculous pleuritic effusion, and as a preventive and to some extent a cure for rheumatic endocarditis.

The Physical and Radiological Examination of the Lungs with special reference to Tuberculosis and Silicosis, including a Chapter on Laryngeal Tuberculosis By JAMES CROCKET, M.D., F.R.C.P.E. 2nd ed. London: H. K. Lewis & Co., 1931. Pp. x and 296. Plates 40. Illustrations 111. Price 16s.

THE above is the full title of the book reviewed last month (p. 318) under the title of "The Physical and Radiological Examination."

Preparations and Inventions

LACARNOL

(London Messrs Bayer Products, Ltd, 19, St Dunstan's Hill,
E C 3)

Lacarnol is an extract of the muscle tissues which is said to exert a selective dilator action on the coronary arteries. Its use is suggested primarily in angina pectoris and such vascular diseases as are due to spasm of the arteries. Even where arterio-sclerosis is present lacarnol may improve markedly the general well-being of the patient by increasing the capacity for work and the body's power of functioning. It is administered in the form of drops, 10 to 25 to be given one to three times daily on a piece of sugar, and may also be given intramuscularly if desired. When an attack of angina pectoris is in progress $\frac{1}{2}$ to 1 c cm of lacarnol solution, as prepared in ampoules, may be given intravenously. It is issued in drop-bottles containing 20 c cm and in ampoules of 1 c cm in boxes of five.

GLUCOSE-D

(London Glaxo Laboratories, 56 Osnaburgh Street, N W 1)

Glucose-D is a high-grade powdered glucose (98 per cent) with the addition of vitamin D and a compound of calcium and phosphorus. The idea of this combination is that as the low fat diets necessary in acidosis are deficient in vitamin D, and generally in calcium, their addition to the glucose compensates for the deficiency, in addition to giving a certain amount of tonic property to the preparation. The suggestion of adding vitamin D, calcium and phosphorus to glucose for the treatment of acidosis certainly seems a sound one to us, and the preparation should prove valuable in practice, both for children and for adults.

NEW HANOVIA MODELS

(Slough The British Hanovia Quartz Lamp Co, Ltd)

The Hanovia Company announce that their well-known standard Alpine sun lamp has been redesigned, and coupled with improved mechanical efficiency it gives considerably increased output. It has a new chromium reflector, which with improved burner design increases the effective ultra-violet output by 30 per cent, while the new operatometer gives the practitioner simple guidance as to correct treatment conditions with the lamp. Further, facilities are provided for the addition of a Sollux lamp on the same base, so that the practitioner can administer simultaneously or separately both ultra-violet and luminous heat radiation.

The Value of Blood Examination in Obscure Cases

By ALFRED PINEY, M.D., M.R.C.P.

*Director of the Pathological Department, Cancer Hospital,
Consulting Pathologist to the Chelmsford and Essex Hospital*

IN recent years practitioners have come to realize that valuable information can be obtained by examining and enumerating the corpuscles and cells of the blood. Unfortunately it is often supposed that this particular form of investigation is only of value in cases of obvious involvement of the blood-forming organs. In practice it may, of course, be impossible to make the performance of a complete blood count a routine procedure; but, even so, the number of cases in which it should be carried out is remarkably high. Even in infective conditions, which cannot be discussed here, variations in the number of leucocytes and alteration of their percentages may be of great prognostic value. It must be realized that most of the so-called "blood diseases" are insidious in onset and may not present any characteristic signs in the early stages.

PERNICIOUS ANÆMIA

A lady, aged 43, had been attended by her practitioner for what appeared to be catarrhal jaundice. In about a fortnight she recovered from this, but was left with slight exophthalmos, pyrexia, definite mental excitement, and excessive emotional reaction. On physical examination a thrill was palpable over the precordium.

and the tongue was remarkably clean, being free from fur even in the posterior part. This condition persisted, and I saw her some four weeks after the onset of the jaundice which, by this time, had completely disappeared. The skin did not appear particularly pale, but the mucosæ were almost blanched. Her blood showed —

Red corpuscles	-	1,300,000 per c mm	
Hæmoglobin	-	20 per cent	
Colour index	-	1.15	
Leucocytes	-	5,000 per c mm	
Neutrophiles	-	32 per cent	consisting of —
		3 per cent	band forms, and
		29 „	polymorphs
Eosinophiles	-	1 per cent	
Monocytes	-	4 „	
Lymphocytes	-	63 „	

The Cooke-count gave a weighted mean of 3.00

The average size of the red corpuscles, as determined with the halometer, was 7.81 microns. Slight polychromasia and poikilocytosis were present, and megalocytosis, although quite obvious, was not extreme. Reticulocytes formed 1.2 per cent of the red corpuscles.

It will be observed that here there was an anæmia with a colour index above 1.0 associated with leucopenia. The differential count of the leucocytes showed relative lymphocytosis, but no abnormal white cells were found. The Cooke-count, which is a modification of the method originally introduced by Arneeth, gives an indication of the average number of lobes in the polymorphonuclear neutrophile leucocytes. Normally the "weighted mean" so obtained is not higher than 2.72. In the present case it was 3.00. In other words, there was an excessive number of polymorphonuclear leucocytes with much nuclear lobulation. Such a condition occurs practically only in pernicious anæmia. The average size of the red corpuscles in health is about 7.2 microns, but in the present case it was 7.8 microns. That is to say, the average size was much above normal. It was clear that this could not be a case of aplastic anæmia because the ordinary signs of regeneration (polychromasia and poikilocytosis) were present, and, indeed, all the characters of the blood were those of pernicious anæmia.

Treatment with liver extract was therefore started, but unfortunately administration by the mouth was followed by severe vomiting, for this reason, four ounces of the dry extract were rubbed up in milk and administered per rectum. Four days after starting treatment the blood showed further well-marked signs that regeneration was proceeding actively, in that the reticulocytes had risen to 9 per cent. The patient by this time felt distinctly better and was now able to take the extract by mouth. She was therefore given the equivalent of a pound of liver daily, and a month later the red corpuscles had risen to 3,100,000 per c mm. She remained under her doctor's care and the amount of liver extract was gradually reduced. I saw her again about twelve months later when her blood showed 5,000,000 red corpuscles per

c mm At this time she was taking only the equivalent of four ounces of liver three times a week

It is, of course, well known that cases of pernicious anæmia often show a slightly icteric tinge, but definite jaundice is not common. In the case just recorded it occurred as a prodromal sign, and was presumably due to intense hæmolysis. In another case the conditions were even more confusing.—

A man, aged 43, had suffered from epigastric pain for some three months, and had twice vomited dark bile-stained fluid. When he consulted his doctor he was deeply jaundiced, and stated that his appetite was poor and that he had lost much weight. On examination a small lump could be felt in the lower part of the epigastrium. The patient was referred to me with a tentative diagnosis of carcinoma of the head of the pancreas. The only abnormal physical signs detected at this time were slight œdema of the ankles, excessive cleanness of the tongue and the absence of the abdominal reflexes. It was not possible to determine whether or not the patient was anæmic because the degree of jaundice was so extreme. Blood examination showed —

Red corpuscles	-	1,490,000 per c mm
Hæmoglobin	-	36 per cent
Colour index	-	1.2
Leucocytes	-	4,500 per c mm
Polymorphs	-	55.5 per cent
Eosinophiles	-	1.5 "
Basophiles	-	0.5 "
Lymphocytes	-	42.5 "
Normoblasts	-	1.0 "

The Cooke-count gave a weighted mean of 3.20. The average size of the red corpuscles, as determined with the halometer, was 3.00 microns. Poikilocytosis, polychromasia and anisocytosis were well marked. A test meal showed absence of free hydrochloric acid. Six weeks later, after liver treatment, the red corpuscles were 4,500,000 per c mm, with 92 per cent of hæmoglobin.

Here was a case in which a raised colour index was associated with leucopenia and slight relative lymphocytosis. The average size of the corpuscles was greater than normal and the polymorphonuclears showed excessive segmentation of the nuclei, furthermore, achlorhydria was present. In spite of the clinical appearances, a diagnosis of pernicious anæmia was made, and six weeks after starting liver treatment the red corpuscles had risen to 4,500,000 per c mm with 92 per cent of hæmoglobin.

It is often supposed that the therapeutic test may be sufficient to justify a diagnosis of pernicious anæmia, that is to say, if the patient improves on liver treatment the disease was pernicious anæmia,

but if not, the diagnosis is supposed to be incorrect. This, however, is not always true. It must be realized that response to liver treatment is dependent upon the existence of a bone marrow capable of adequate reaction. If this is not present the administration of liver is not followed by immediate improvement. Sometimes increasing the amount of liver will elicit an adequate response, but occasionally blood transfusion is necessary. Liver treatment often exerts its beneficial effects after such procedure, although it had been almost ineffective before it.

A woman, aged 68, complained of pain in the lower part of the chest for some four months, this was so severe as to interfere with her sleep. She also complained of palpitation, but there was neither vomiting nor jaundice, she had lost a considerable amount of weight and her appetite was poor. Her tongue was furred, but no other abnormal physical signs were found. The presence of the furred tongue and the loss of weight appeared to be evidence against a diagnosis of pernicious anæmia, but there was complete achlorhydria and the blood count showed —

Red corpuscles	-	1,140,000 per c mm	
Hæmoglobin	-	29 per cent	
Colour index	-	1.26	
Leucocytes	-	6,600 per c mm	
Neutrophiles	-	41.0 per cent	Consisting of —
		1.3 per cent	band forms, and
		39.7 „	polymorphs
Basophiles	-	0.3 per cent	
Monocytes	-	6.3 „	
Lymphocytes	-	52.4 „	
Megaloblasts	-	1.7 „	

Polychromasia well marked. Anisocytosis and megalocytosis present.

The average size of the red corpuscles, as determined with the halometer, was 7.81 microns.

As will be seen, the colour index was above 1.0, there was slight leucopenia and well-marked relative lymphocytosis, whilst megaloblasts were numerous. A diagnosis of pernicious anæmia was, therefore, made, and treatment with liver and liver extract was started. Fourteen days later there was practically no change in the blood-picture. It was, therefore, decided to give a blood transfusion and then continue the administration of liver. This was done, and a month later the red corpuscles had risen to 3,400,000 per c mm. Here we have, therefore, an example of a clinically atypical case of pernicious anæmia in which the response to liver treatment was sluggish until the bone marrow was given an initial, non-specific stimulus.

ACHLORHYDRIC ANÆMIA

Occasionally one encounters a case in which the clinical features very strongly suggest pernicious anæmia whilst the blood count definitely contradicts this diagnosis.

A woman, aged 62, had been subject to slight attacks of soreness of the tongue for some years, and for this reason all her teeth had been removed. About two months before I saw her she had had an acute attack of vomiting and diarrhoea, the latter had persisted. A fractional test meal showed achlorhydria, there was not any occult blood in the stools and the van den Bergh test was negative. Her blood showed —

Red corpuscles	2,500,000 per c mm
Hæmoglobin -	40 per cent
Colour index -	0.8
Leucocytes -	7,200 per c mm
Polymorphs -	58 per cent
Eosinophiles -	1 „
Monocytes -	9 „
Lymphocytes -	32 „

The average size of the red corpuscles, as determined with the halometer, was 7.17 microns.

It will be observed that here there was a fairly severe degree of anæmia with a colour index below 1.0 and slight lymphocytosis. The average size of the red corpuscles was normal and none of the hæmatological characters of pernicious anæmia could be found. This condition is not at all uncommon in middle-aged and elderly women, severe anæmia being associated with achlorhydria. Occasionally there are complaints of soreness of the tongue and sometimes dysphagia. The administration of hydrochloric acid does not effect the anæmia, but iron appears to have an almost specific action. It is, however, essential that large doses should be given. The patient mentioned above was treated by the administration of 80 grains of iron and ammonium citrate daily, and at the end of three weeks her red corpuscles numbered 3,750,000 per c mm. Two months after this they had risen to 5,000,000 per c mm.

This *achlorhydric anæmia of middle-aged women* is undoubtedly a common cause of ill-health. In the past it was often referred to as delayed chlorosis, and certainly it has the general characters of that disease as it used to be seen. It is obviously of great importance to perform a careful blood examination in all cases of anæmia. If, for example, this case had been diagnosed as pernicious anæmia on clinical grounds, and had been treated with liver or liver extract, no improvement would have been obtained. The indiscriminate pre-

scribing of liver or liver extract in all cases of anæmia without the preliminary performance of a blood examination should be deprecated, both because it increases the price of liver, and also because it is practically useless except in those patients who are really suffering from pernicious anæmia.

MYELOID LEUKÆMIA

Surprises are not uncommon in connection with the diagnosis of the exact nature of splenic enlargement. It should, of course, be obvious that the blood of every patient with splenomegaly should immediately be examined, because no purely clinical method is capable of distinguishing between the various types. Occasionally the increase in bulk of the spleen does not present the typical shape, it is not uncommon for the lower pole to extend directly inwards towards the middle line instead of downward and to the right as is usually described. When such atypical enlargements are encountered it is often difficult to be certain that the mass is really composed of splenic tissue.

A man, aged 43, had complained of malaise, indigestion, flatulence and loss of appetite of some six months' duration. He was referred to me as a probable case of carcinoma of the stomach. This view was based on the patient's statements, and on the fact that he could eat only small quantities of food at a time. Further more, epigastric pain, relieved by vomiting, together with loss of weight were prominent features. Palpation of the abdomen revealed the presence of a firm smooth lump in the lower part of the epigastrium. Careful examination convinced me that this lump was continuous with the spleen, and blood examination showed —

Red corpuscles	-	3,400,000 per c mm	
Hæmoglobin	-	68 per cent	
Colour index	-	1.0	
Leucocytes	-	265,000 per c mm	
Neutrophiles			
Myelocytes	-	6.7 per cent	} 68.5 per cent
Young cells	-	19.0	
Band cells	-	11.7	
Polymorphs	-	31.1	
Eosinophiles			
Myelocytes	-	0.7	} 5.4
Metamyelocytes	-	1.0	
Polymorphs	-	3.7	

Basophiles				
Myelocytes	-	0 3	per cent	} 3 0 per cent
Polymorphs	-	2 7	"	
Monocytes	-	-	-	2 0 "
Lymphocytes				
Non-granular	-	-	-	3 7 "
Myeloblasts	-	-	-	1.7 "
Premyelocytes				
Neutrophile	-	13 7	per cent	} 15 7 "
Eosinophile	-	1 0	"	
Basophile	-	1 0	"	
Normoblasts	-	-	-	0 7 "
Total abnormal cells				59 6 "
" normal	"			40 0 "

Slight polychromasia and anisocytosis

With suitable treatment the man has remained alive and in good health for over twelve months. This is obviously a case of typical chronic myeloid leukaemia, in which diagnosis is important because adequate therapeutic measures can cause great improvement, even if they do not prolong life.

SIMPLE ANÆMIA

It is necessary to call attention to some difficulties that may arise in connection with an apparently simple case of anæmia. For example—

A man, aged 26, had complained of shortness of breath, palpitation and pallor of some four months' duration. The only abnormal physical sign detected was the presence of a faint cloud of albumen in the urine. The blood showed—

Red corpuscles	-	2,784,000	per c mm	
Hæmoglobin	-	38	per cent	
Colour index	-	0 6		
Leucocytes	-	9,200	per c mm	
Neutrophiles				
Band cells	-	1 0	per cent	} 77 7 per cent
Polymorphs	-	76 7	"	
Eosinophiles	-	2 3	"	
Basophiles	-	0 3	"	
Monocytes	-	5 7	"	
Lymphocytes	-	14 0	"	

Here there was definite anæmia with low colour index and slight leucocytosis. Immature neutrophiles were not above normal in number, and the eosinophiles were not decreased. There was, however, no hematological evidence that the condition was due to infection. As no obvious cause for the anæmia could be found, it was decided that estimation of the blood urea might be of value. It is well known that severe anæmia may accompany any form of nephritis, and, as in this case the blood urea was extremely high, the cause of the anæmia was therefore obvious.

The nature of *anæmias in elderly persons* is

particularly difficult to determine

A lady, aged 78, had been operated on for carcinoma of the breast some twenty years before I saw her. For twelve months she had been suffering from shortness of breath and palpitation, and her friends had noticed increasing pallor. Blood examination showed —

Red corpuscles	-	3,200,000 per c mm	
Hæmoglobin	-	64 per cent	
Colour index	-	1.0	
Leucocytes	-	10,600 per c mm	
Neutrophiles			
Myelocytes	-	0.6 per cent	} 31.6 per cent
Young cells	-	3.4 "	
Band cells	-	3.4 "	
Polymorphs	-	24.2 "	
Eosinophiles	-	0.8 "	
Basophiles	-	0.4 "	
Monocytes	-	5.2 "	
Lymphocytes	-	61.8 "	
Premyelocytes	-	0.2 "	

There were 13.0 per cent of normoblasts, viz. 65 were seen counting 500 leucocytes.

It will be noticed that here there was a moderate degree of anæmia with slight leucocytosis. The striking feature of the leucocyte picture was the presence of immature granular cells and great lymphocytosis. Even more striking was the presence of large numbers of nucleated red cells. Ordinarily the stimulus that causes emigration of normoblasts into the circulation is a deficiency of oxygen. In other words, the number of normoblasts in the circulation is usually proportional to the severity of the anæmia. In the present case there were far more nucleated red cells in the blood than would have been expected with so slight a reduction in the number of red corpuscles. Furthermore, the presence of immature granular leucocytes was a further indication of the presence of some irritant in the bone marrow. The appearances were compatible with a diagnosis of secondary deposits of malignant tumour in the bones. Even so, the picture was not quite typical because, as a rule, neutrophilia rather than lymphocytosis occurs in this condition. Nevertheless, the diagnosis was made and confirmed by radiographic examination.

The patient lived for about three months from the time that the diagnosis was made, and no symptoms referable to the skeleton, and no spontaneous fractures occurred. At autopsy it was necessary to split the long bones before metastases could be found. It is important, therefore, to realize that the absence of suggestive symptoms is not a sound reason for excluding the possibility of secondary neoplasia of the bone marrow.

POLYCYTHÆMIA

It is, of course, impossible to discuss here all the possible difficulties that may be met with in connection

with diseases of the blood, but one more case can be discussed —

A man, aged 63, was admitted to the Cancer Hospital, London, with a diagnosis of carcinoma of the rectum. This was based on the occurrence of hæmorrhages, but digital examination failed to show the presence of a tumour. The sigmoidoscope did not reveal any growth, but the mucosa was intensely congested. The patient stated that he had suffered from giddiness and dyspnœa for about eight months. He was deeply cyanotic, and on clinical examination a small lump could be felt in the left hypochondrium. As the abdominal wall was rigid it was not possible to be certain that this was the spleen. Blood examination showed —

Red corpuscles	-	12,800,000 per c mm	
Hæmoglobin	-	137 per cent (more than)	
Leucocytes	-	10,200 per c mm	
Neutrophiles			
Young cells	-	1 5 per cent	} 81 0 per cent
Band cells	-	3 5 ,,	
Polymorphs	-	76 0 ,,	
Eosinophiles	-	4 0 ,,	
Basophiles	-	0 5 ,,	
Monocytes	-	5 0 ,,	
Lymphocytes	-	9 5 ,,	

Here there was an enormous increase of red corpuscles, and the case was obviously one of polycythæmia. It is, however, necessary to carry out extensive examinations of such patients, because symptomatic increase of red corpuscles may occur as the result of widespread infiltration of the lungs by tumour cells. X-ray examination of the gastro-intestinal tract, kidneys and gall bladder excluded this suggestion as far as possible, and the patient responded well to injections of phenylhydrazine hydrochloride.

It is hoped that sufficient has been said in this short article to make clear the great importance of blood examination in difficult cases, even when the clinical signs do not particularly suggest the possibility of disease of the hæmatopoietic organs.

tion the treatment of septicæmia was discussed, and I was very much surprised at the small value that appeared to be attached to blood transfusion in this connection. It is, of course, exceedingly difficult to assess exactly the influence of any given remedy in so fatal a disease, but there have been, even within my own limited experience, so many striking recoveries following transfusion, that I have been forced to regard the treatment as having played an important part in producing the result. It is the temperature chart that commonly provides the most convincing evidence of the value of the remedy, cause and effect being there so graphically associated, that denial is almost impossible. The infecting organism has been sometimes streptococcus, sometimes staphylococcus. In both cases the patient's resistance does seem sometimes to be notably stimulated by transfusion.

In the field of pure surgery the position of blood transfusion has remained unassailed, and it is difficult to imagine that any satisfactory substitute for blood will ever be discovered. Normal salt solution or carefully prepared gum-saline may be used as an expedient in an emergency, but the claim can never now be made that either is comparable in its effect with blood. In a surgical emergency the patient is suffering from an acute anæmia due to depletion of the circulating fluid, either by actual loss of blood through a wound, or from the effect of shock in immobilizing the blood in the capillary bed. Twice within recent years I have successfully removed ruptured kidneys from medical students injured in football matches, whose chances of recovery would have seemed almost negligible had operation been the only means of treatment available. Both of these students were transfused both before and after operation, each receiving in all nearly $1\frac{1}{2}$ litres of blood. This was only reflecting an observation made on innumerable occasions during the Great War, but it cannot be too often repeated that the best

method of preventing death from loss of blood is by replacement of the blood that has been lost. This statement would seem to err on the side of obviousness, yet if it were really so obvious as it appears, then there would be no surgical centre in this country, however small, where there was not an organization for the provision of a blood donor at short notice, and the knowledge requisite for carrying out a transfusion. During the last nine years the London Blood Transfusion Service, organized under the ægis of the British Red Cross Society by Mr. P. L. Oliver, has pointed the way, and voluntary blood donors have been available day or night in London in every emergency. Gradually Mr Oliver's example is being followed in an ever-increasing number of places. It may not be possible to ascertain on all occasions the patient's blood group and to provide a donor of the same group, but it is always possible to have several donors of the group O (Moss group IV) on call, the "universal donor" principle being sufficiently near the truth to be justifiably applied in any emergency.

As to the method of transfusion which should be used when donor, patient and operator are assembled, much has been written. One of the earlier Continental writers on this subject, Hustin, remarked in 1871. "Too much stress is laid on technique, as in all operations which are still in the stage of their infancy. First, many new instruments are invented which are the pride of their inventors, then the technique becomes a minor detail, and the indications the main object. Of all the instruments, only the simplest are kept." Methods of blood transfusion have been passing through this process of elimination during the last ten years, and it is, indeed, not yet finished. New instruments are still being described, used for a short time, and forgotten, and it is important to keep in mind the basic principles of the technique. Ever since the introduction of sodium citrate in 1914 as an anticoagulant, discussion

has centred round the pros and cons for its use. It has many times been stated that the post-transfusion "reactions," evidenced by a mild rigor with transient rise in the temperature and pulse-rate, were due to the use of citrate as an anticoagulant. No general agreement, however, has been reached on this point, and it still remains for the untreated-blood school to prove their point. The weakest joint in their argument appears to me to be the fact that the most convinced anti-citrationists do not claim to abolish reactions by eschewing citrate, but only to reduce their incidence in varying degrees. In fact reactions still occur quite frequently in the absence of citrate, and it is therefore obvious that the point at issue is not whether citrate is alone responsible for reactions, but how far it influences the other factors which clearly exist. In my opinion far too much stress has been laid on the importance of these reactions. Never in my experience has a patient suffered in the long run from the occurrence of this type of reaction, and it seems to me that the question should be subordinated to the more practical one of how the transfusion can be most efficiently performed. There can be no question that for the majority of operators, who are not called upon to perform a transfusion very frequently, the use of sodium citrate offers the method which requires by far the least practice or special knowledge. The properties necessary for staging a transfusion in an emergency can therefore be reduced to —

(1) A large-bore needle, such as French's, for inserting into the donor's vein, with a rubber tube attached

(2) Sodium citrate to the amount of 1 gramme for each 450 c cm of blood. This can be conveniently kept in concentrated solution in ampoules ready for immediate use. Each ampoule containing 1 gramme must be diluted with 2 oz of sterile water

(3) A vessel in which the blood can be conveniently

mixed with the citrate solution by stirring.

(4) A set of ordinary infusion instruments, since citrated blood may be injected by gravity through a funnel as if it were saline solution.

The operator need have no special knowledge beyond ordinary skill in putting needles into veins, and it is unnecessary to regard the process with any awe provided reliance can be placed upon the correctness of the blood-grouping tests previously done upon the donors. It is necessary to feel absolutely certain that the supposed group O donor really is of that group, so that this preliminary investigation must be done by a skilled observer. The expert operator will, of course, introduce various refinements into his apparatus so that he may achieve an operation bloodless except where blood should be, and in all respects æsthetically satisfying, but this need not be insisted upon when a patient's life is at stake.

The method that I have used consistently during the last fifteen years, with only minor modifications, is illustrated in the accompanying drawings. In Fig. 1 (p. 428) the anterior wall of the donor's vein has been transfixed with a fine round-bodied needle to facilitate the introduction of the large French's needle. This vein should never be exposed by dissection, and the donors of the London Blood Transfusion Service are instructed not to permit it to be done on their arms. Fig. 2 shows the introduction of the blood into the patient's vein, the flow being controlled by means of a rubber bellows and an air-lock. The clip on the delivery tube (in the drawing) must, of course, be released to allow the blood to flow. The method has been described in detail elsewhere.¹

The all-important question of having a donor of the right blood group need not be clouded by doubts in an emergency. In spite of occasional reports to the contrary, it is still believed that no individual in health ever changes his blood group. Mistakes have

Agranulocytosis and Aplastic Anæmia as Varieties of Bone-Marrow Failure

By F PARKES WEBER, M.A., M.D., F.R.C.P.
Senior Physician to the German Hospital, T

APLASTIC (hypoplastic) anaemia signifies any anæmia (oligocytopænia) due, not to any loss or excessive destruction of the red body (in the spleen, etc.), but to their diminution in the bone-marrow. As a matter of fact, it is usually accompanied by deficient production of red cells (hypochromia), and by deficient production of other blood-elements derived from the bone-marrow, namely, the granulocytes and the platelets. Extreme thrombocytopenia is doubtless present in those cases of aplastic anæmia characterized by an excessive hæmorrhagic tendency, but hæmorrhagica is not a necessary accompaniment of aplastic anæmia (as some writers seem to have supposed it to be), and when cutaneous and mucous hæmorrhages are not conspicuous, there is no extreme thrombocytopenia present.

The cases in which granulocytopenia constitutes the most conspicuous change in the blood can well be grouped together as cases of agranulocytosis or hypogranulocytosis, and such cases in which there is a (as there mostly is) considerable though less conspicuous erythrocytopenia, may be termed cases of agranulocytic or hypogranulocytic anæmia. Between the two pictures of agranulocytosis and of aplastic

anæmia there are probably no well-defined boundaries, and the blood-picture of agranulocytosis may terminate as one of aplastic anæmia.

A hypoplastic condition of the bone-marrow may in some cases be due to old age or exhaustion, showing itself, for instance, by a delayed and hypoplastic type of recovery from hæmorrhages, but such chronic cases are not what is generally known as *aplastic anæmia*, which is usually of acute or subacute onset. The exciting cause of the latter is by no means always

and doubtless in some cases there is a constitutional element, which may have been hitherto shown itself merely by an occasional moderate degree of pallor. I observe more or less complete and sudden apocytosis in cases of aplastic anæmia, the exciting cause, to the sudden almost total cessation of hair-production in cases of alopecia

as observed in youth and young adults, who appear otherwise healthy.

In other cases of aplastic anæmia the exciting cause is some septic process or toxin (arsenobenzol used in the treatment of syphilis, accidental benzol poisoning,

FIG 19. TNT. poisoning in munition-workers during the Great War), or both combined, and in

for all the reasons of the view that *agranulocytosis* may be practically only a variety of *aplastic anæmia*, it should be noted that according to many some previous observations the same causative factor (for not because, a septic process, or arsenobenzol used in the treatment of syphilis) may be followed sometimes by

the blood-picture of the type of agranulocytosis, sometimes by one of aplastic anæmia. I would even suggest that some of the examples of purpura and hæmorrhagic tendency associated with septic processes and infections and with the action of various toxins, may be explained as manifestations of an analogously produced hypoplastic thrombocytopænia. I would

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APLASTIC (hypoplastic) anæmia signifies any anæmia (oligocytopænia) due, not to any loss or excessive destruction of the red body (in the spleen, etc.), but to their failure in the bone-marrow. As a matter of fact, it is a marked deficient production of red cells (hypocæmia) which is usually accompanied by deficient production of other blood-elements derived from the bone-marrow, namely, the granulocytes and the platelets. Extreme thrombocytopenia is doubtless present in those cases of aplastic anæmia characterized by an excessive hæmorrhagic tendency, but a severe hæmorrhagica is not a necessary accompaniment of aplastic anæmia (as some writers seem to have supposed it to be), and when cutaneous and mucous hæmorrhages are not conspicuous, there is usually no extreme thrombocytopenia present.

The cases in which granulocytopenia constitutes the most conspicuous change in the blood can well be grouped together as cases of agranulocytosis or hypogranulocytosis, and such cases in which there is also (as there mostly is) considerable though less conspicuous erythrocytopænia, may be termed cases of agranulocytic or hypogranulocytic anæmia. Between the blood pictures of agranulocytosis and of aplastic

to the Association of Physicians (Sheffield Meeting, May 22, 1931) This man, whose anæmia developed in early January 1931, has now had 16 large blood-transfusions, and his erythrocyte-count, which on February 18 was only 770,000, is now (June 27) 2,880,000 (though only reaching this level after an intensive series of blood-transfusions at short intervals from each other).

Moreover, R. Stewart Harrison* has described (April, 1931) the case of a man, aged 30 years, with aplastic anæmia, who has been kept alive and relatively capable of work for 4 or 5 years by considerably over a hundred blood-transfusions The case had been demonstrated by A. F. Hurst and C. F. Cosin at the meeting of the Medical Section of the Royal Society of Medicine at Guy's Hospital on November 25, 1930, when I had the privilege of seeing him There can be indeed no question of mistaken lymphatic leukæmia in that case! In regard to all cases of apparently primary aplastic anæmia I suppose one ought never to give up hope that spontaneous erythropoiesis will ultimately increase and become sufficient to maintain life and health. One knows that after complete alopecia of uncertain causation has lasted even for years, the growth of hair will sometimes spontaneously recommence—probably more often it only “flickers.” I have alluded to this subject of the growth of hair elsewhere—perhaps my analogy is really a useful (not too superficial) one.

But to resume my main subject, there is sometimes an anæmic blood-picture, apparently of aplastic type, during the course of a case of acute lymphatic leukæmia.

In a recent fatal case, possibly of acute lymphatic leukæmia, or rather aleukæmic lymphadenosis, in a girl (aged 5½ years), for permission to allude to which I am indebted to my colleague, Dr E. Schwarz, there was a remarkable blood-picture of agranulo-

* R. Stewart Harrison *Guy's Hosp Reps*, 1931, lxxxv, 215.

further compare the selective action of such "agents" on the combined or separate hæmopoietic functions of the bone-marrow to the selective action of chloroform and phosphorus on the secreting cells of the liver (acute or subacute atrophy or necrosis), perchloride of mercury and some other poisons on the cells of the renal convoluted tubules, and the depilatory action of thallium on the hairy scalp (or, rather, one should say, on the nervous mechanism connected with the hair-growth)

Another reason for regarding agranulocytosis as practically only a variety of aplastic anæmia is that in some stages of acute lymphatic leukæmia the blood-picture may occasionally show hypoplastic anæmia, but occasionally rather a hypogranulocytosis. At one time it was, I believe, suggested by some that all cases of acute aplastic anæmia without obvious cause were in reality a stage of acute lymphatic leukæmia (or aleukæmic lymphadenosis) with a fatal termination before the typical changes in the blood-picture had developed. This can, however, no longer be maintained since patients with aplastic anæmia can nowadays be kept alive by blood-transfusions for indefinite periods, even if the erythropoietic function of the bone-marrow fails to reassert itself, and there would be plenty of time for specifically leukæmic changes to develop if the aplastic anæmia were really only a stage or variety of lymphatic leukæmia. Indeed, in the face of a careful post-mortem examination, that theory could not have been upheld in a young man with acute aplastic anæmia (E B, aged 18 years), whose case I described in 1914,* but would be still more impossible in the case of a man (J T, aged 31 years) now under my care at the German Hospital, whose case I shortly communicated

* F Parkes Weber *Proc Roy Soc Med*, 1914, vii, *Section of Medicine*, 179-188, *Folia Hæmatol* (Archiv), Leipzig, 1915, vii, 15-24

cytic anæmia during the rapidly fatal illness. Hæmoglobin, 38 per cent, erythrocytes, 1,840,000, colour-index = 1.0, leucocytes, 7,450. The differential count of the leucocytes was made two days later, polymorphonuclears, 3 per cent, small lymphocytes, 82 per cent, large lymphocytes, 14 per cent, monocytes, 1 per cent. One nucleated red cell was seen. There were very few thrombocytes. In that case there was no enlargement of spleen or liver, but some lymphatic glands were slightly enlarged towards the end. There was a history of preceding infectious illnesses, and as there was no necropsy, the leukæmic nature of the illness was not proved.

Now, as to X-rays or radium being capable of causing aplastic anæmia and agranulocytosis, I need not here refer to the various published accounts of aplastic anæmia supposed to have been connected with X-rays or radium*. But the following case seems to show that radium may cause a blood-picture of anæmia with predominant hypogranulocytosis.

The patient, a rather thin and somewhat cachectic-looking, well-built man (J. R.), aged 52 years, was admitted to the German Hospital on April 22, 1931, with painless enlargement (moderate degree) of the lymphatic glands in the lower part of the right side of the neck and a much larger "packet" of glands in the right axilla. For 4 months he had had cutaneous pruritus, worse during the last two weeks. Apparently the pruritus had preceded the glandular enlargement, and he had paid less attention to the latter. The lymphatic glands in the groins were not greatly enlarged, and indeed they might be regarded as almost within normal limits. By radiographic examination of the thorax the hilum shadowing of the right lung was rather large. The liver and spleen could not be felt, and there was nothing abnormal by abdominal palpation. Before the present illness he had apparently enjoyed good health.

In the hospital the diagnosis of lymphogranulomatosis maligna (Hodgkin's disease) was definitely established by the microscopic examination of one of the lymph-glands excised from the right axilla for "biopsy" purposes on April 25. The gland was of the

* On the occurrence of aplastic anæmia in connection with irradiation (X-rays and radium), and on acute constitutional symptoms of various kinds following irradiation as touched on in this paper, compare Sir Humphry Rolleston's critical review on "The Harmful Effects of Irradiation (X-rays and radium)," *Quart. Journ. Med.*, Oxford, 1930, xxii, 101-131. On irradiation (X-rays or radium) as an alleged possible cause of myeloid or lymphatic leukæmia the evidence is not convincing, see Rolleston, *loc. cit.*, p. 117, and Evans and Roberts, *Lancet*, 1928, ii, 748 (both these papers include an analysis of the French cases).

size of a small chestnut and on section had a pale, faintly pinkish, translucent appearance. Microscopically, the glandular structure was abnormal, there was much fibrosis, no typical germ-centres could be distinguished, amongst the lymphocytes there were abundant cells of endothelial type, with scattered "Hodgkin giant cells," and numerous eosinophil cells.

Blood-count (April 22) Hæmoglobin, 86 per cent, erythrocytes, 4,600,000, colour-index = 0.94, leucocytes, 9,200 (metamyelocytes, 2 per cent, polymorphonuclears, 88 per cent, lymphocytes, 6 per cent, monocytes, 4 per cent). This blood-picture fitted in quite well with the diagnosis of lymphogranulomatosis maligna. The urine showed nothing abnormal. Blood-pressure 125/70 mm Hg. The blood-sedimentation was 15 minutes instead of the normal of about 60 minutes by the method employed. The blood-serum gave negative Wassermann and Meucke reactions. There was a little pyrexia (*see chart*, p. 437).

On May 21 the patient was admitted to the Radium Institute and 540 mgs radium, screened Pb 2 mm, were applied for 46 hours to the situations where enlarged glands were found (information kindly furnished by Dr J. K. Harper). After some time at his own home he was readmitted on June 16 to the German Hospital in a very feeble, tremulous state, sometimes wandering in his mind. Temperature, 102.2° F, pulse, 108, respirations, 31 per minute (*see chart*). The glandular enlargement had become much less, or indeed, had almost disappeared as a result of the radium treatment, but the general condition of cachexia and feebleness had very greatly increased and there was some decubitus over the sacrum and left hip. The edge of the liver, but not the spleen, could now be felt a little below the costal margin. The urine was of specific gravity, 1.025, acid, free from sugar, but containing a trace of albumin and a few tube-casts, negative diazo reaction. Death occurred with extreme general weakness (exhaustion) on June 21.

A necropsy could not be obtained, but owing to the "biopsy" examination, etc., there can be no doubt that the disease was lymphogranulomatosis maligna, and that the man was much worse after the radium treatment than before it. Significant is the contrast when one compares the temperature and pulse chart after readmission with that taken some time before the radium treatment, but of still greater interest from the point of view of the main subject of this paper, is it to compare the blood-count of April 22 (as given above) with that taken on June 18 (after readmission), showing great increase in the anæmia, with leucopenia and predominant hypogranulocytosis—Hæmoglobin, 53 per cent, erythrocytes, 2,400,000, colour-index = 1.1, leucocytes, 900. The red cells showed some anisocytosis and poikilocytosis. The differential count gave—metamyelocytes, 2 per cent, polymorphonuclears, 52 per cent—that is, 468 instead of the normal of about 4,700 to the c.mm of blood, and lymphocytes, 46 per cent, that is, 415 instead of the normal of about 1,500 to the c.mm of blood. (This presence of lymphocytopenia in addition to the much more marked granulocytopenia should be noted.)

It is now an old question whether X-ray treatment in cases of lymphogranulomatosis maligna can really prolong the patient's life or not, but, provided it does not actually harm him, the patient may be pleased to see the obvious outward manifestations of his disease fade away under the treatment, at all events for a time. In some cases one cannot help suspecting that this melting away of an external group of enlarged lymph-glands under X-ray treatment may in some way hasten the onset of the stage of generalization of the disease with enlargement of liver and spleen, and often with pyrexia. There are some theoretical points bearing on this question to which I have alluded elsewhere *

At any rate, radium treatment seems to have done actual harm in the case described above, and I should now hesitate to advise a trial of the same treatment in the same disease, especially where, owing to a cachectic appearance and some chronic pyrexia, there is a suspicion that the stage of internal generalization of the disease is already commencing. Dr Harper, the surgical registrar at the Radium Institute, kindly informs me that amongst the other cases of Hodgkin's disease which have been treated there he can find no record of a blood-picture approaching that which supervened in J R.

On another occasion one might think of the possibility of blood-transfusion being helpful for a similar result of radium treatment.

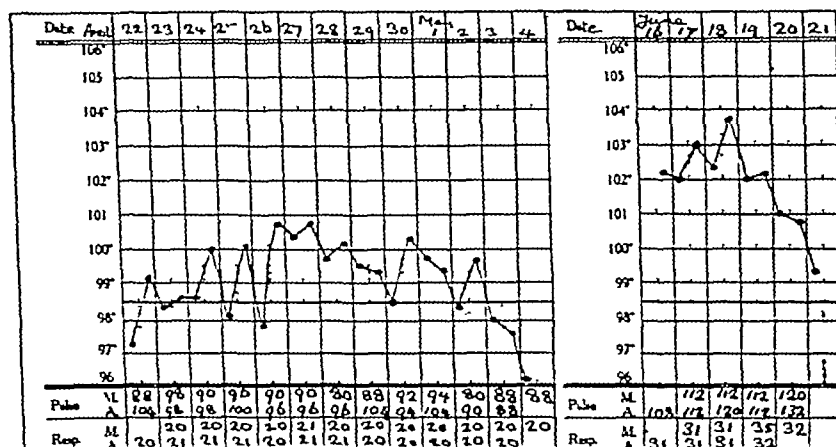
The chart here reproduced shows the morning and afternoon temperature, pulse and respiration in the hospital before the radium treatment, and, on re-admission, some time after the treatment.

It has, I believe, been supposed that if the application of X-rays or radium to a tumour be followed

* F P Weber "Notes on Hodgkin's Disease (Lymphogranulomatosis Maligna)," *Medical Press*, London, 1924, clxix, 347-351 (the terminal portion, on treatment)

by rapid spreading or generalization, the application has probably been insufficient and of a stimulating rather than destructive character. Recently, how-

TEMPERATURE CHART (mornings and afternoons)



ever, I have seen a case in which the application of radium was followed by extraordinarily rapid generalization of a lymphosarcoma-like growth, as if the radium had had a stimulating (insufficient) effect, though this was accompanied by extreme bodily and mental weakness of the patient (acute constitutional symptoms), as if the radium-dosage had been excessive.

The case (which I communicated shortly to the Association of Physicians at the Sheffield meeting, May 1931) was that of an elderly woman, who received radium treatment, about May 12, 1930, for a subcutaneous growth of some kind on the left side of the lower jaw, first noticed about 6 months previously. On examination (July 7, 1930), about 8 weeks after the radium treatment, the swelling over the jaw had entirely disappeared, and no glands were palpable in the neck. About two weeks later (July 19) she was admitted in an extremely feeble condition to hospital, where she died with progressive myocardial weakness on August 7 (19 days after admission). Remarkably rapid enlargement of most of the superficial lymph-glands and spleen and liver was observed towards the end.

In the last case (which will be described in full

elsewhere) the histological examination was unfortunately incomplete (limited to two lymphatic glands) and the disease may really have been lymphogranulomatosis maligna (Hodgkin's disease), in which it is admitted that some of the enlarged lymphatic glands may present histologically a lymphosarcomatous appearance rather than the characteristic changes described by Sternberg, etc. In regard to the effects of radium treatment this case may therefore be compared and contrasted with the one described in this article of undoubted lymphogranulomatosis maligna (the man, J R, aged 52 years), in which leucopenia with hypogranulocytosis followed the treatment

Simple Achlorhydric Anæmia and Allied Forms of Anæmia

By L. J. WITTS, M.D., F.R.C.P.

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IN a previous number of *THE PRACTITIONER*¹⁹ I have described the clinical features of simple achlorhydric anæmia. In the present article I wish to describe the progress of our studies of chronic secondary anæmia. Easy as it is to overrate the importance of a subject in which one is interested, one cannot but feel that the frequency of chronic anæmia, especially in adult women, is only just beginning to be realized. It is one of the commonest diseases, and in a short time it has been possible for us to study a large number of cases. The simple clinical observation of these patients has already given much information about the pathology and treatment of chronic secondary anæmia.

The commonly accepted causes of secondary anæmia are hæmorrhage, infection, toxæmia, and new growth, but there remains a large residue of cases in which all these factors are absent. These unexplained secondary anæmias are not a heterogeneous and unrelated collection of cases. They resemble each other closely in pathology and clinical course, and form a group which is so well-defined and homogeneous as to constitute a definite disease entity. It is preferable to call these unexplained secondary anæmias "chronic microcytic anæmia," thus stressing the diminished hæmoglobin content of the red cells and low colour index. In a series of all forms of secondary anæmia treated at Guy's Hospital in the years 1927 to 1929, 15 per cent.

were of this unexplained type Within a few years I have been able to collect 120 cases of unexplained chronic secondary or microcytic anæmia. Ninety per cent. of them were women, and it will be convenient to discuss these female cases first, as chronic microcytic anæmia is so essentially a disease of women

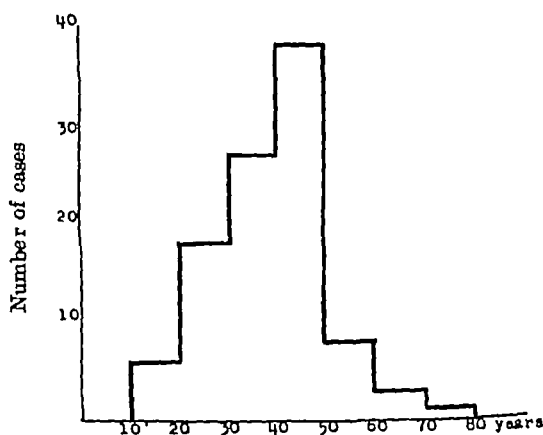


FIG. 1.—Age incidence of chronic microcytic anæmia in women.

On charting the age at which the women attended hospital, two interesting points were evident. The first was the decrease almost to vanishing point of adolescent chlorosis. For the disappearance of what was once so common a disease, no satisfactory explanation has ever been offered.² Secondly, it is clear that anæmia in women is a disease of the reproductive epoch. The maximum incidence is between the ages of 20 and 50, and there is an abrupt fall after the menopause. In collecting the cases, special care had been taken to exclude all which might reasonably be attributed to menorrhagia or to hæmorrhage at confinement, but this association of anæmia with the age of menstruation and child-bearing was so striking that the reproductive function in the anæmic women was more closely studied. On comparing the onset and amount of menstruation, the fertility, number of children and miscarriages, and the frequency of post-partum

bleeding, no significant difference was found between these women and their healthy sisters. Climacteric hæmorrhage and post-partum hæmorrhage were both a little commoner than in health, but this is probably the result of relaxation of an anæmic uterus, and not causally related to the anæmia.

TABLE 1

MENSTRUAL FUNCTION IN CHRONIC MICROCYTIC ANÆMIA

<i>Onset</i>						
Age	Control (Veit-Stœckel) ¹⁶				Anæmia	
9-12	-	-	5	75 per cent	-	7 per cent
14-16	-	-	52	10	-	55
13-18	-	-	85	12	-	91
19-	-	-	9	12	-	2
<i>Amount</i>						
Normal	-	-	-	-	38	per cent
Scanty	-	-	-	-	38	„
Excessive	-	-	-	-	24	„

Menstruation tends to be scanty in early years and excessive at menopause.

TABLE 2

REPRODUCTIVE FUNCTION IN CHRONIC MICROCYTIC ANÆMIA

72 per cent are married and 28 per cent are single.

Among the married women —

Sterile marriages	-	10 per cent
Control (Veit-Stœckel) ¹⁶	-	7-15 per cent
Average children	-	3 0

Of the total pregnancies —

Abortion	-	15 per cent
Control (Wilhams) ¹⁷	-	10-20 per cent
Postpartum hæmorrhage	-	4 3 per cent
Control (Blacker) ¹	-	0 8

It is an interesting and important fact that all forms of chronic secondary anæmia, whether spontaneous or associated with other organic disease, are much more common in women than in men.¹³ Studies of transfusion donors have likewise shown that women are unable to give as much blood as men and that individual women differ greatly in their ability to repair loss of blood.⁵ The reproductive function in women makes a heavy demand on the blood-forming

most troublesome dysphagia, which then becomes the cardinal symptom. This combination of anæmia and dysphagia is often called the Plummer-Vinson syndrome, though it was earlier described by the British laryngologists Kelly and Paterson^{6, 11}

Many of these symptoms are characteristic of disturbed nutrition. Koilonychia is found also in anorexia nervosa and in chronic phthisis. Glossitis occurs in pernicious anæmia, sprue, pellagra, and allied disorders of digestion and nutrition. Dysphagia may occur in pellagra¹⁵ and œsophagitis in sprue⁸. I believe that in the chronic microcytic anæmia of women, iron and possibly other minerals such as copper are imperfectly absorbed owing to the digestive defect, and that this is the most important cause of the diminished blood-formation. This view is confirmed by experiments of Mettier and Minot,⁹ which showed that the absorption of iron was diminished when the contents of the stomach and upper intestine were kept alkaline—conditions strictly comparable with those in achlorhydria. Further arguments in favour of the view that simple achlorhydric anæmia is a deficiency disease, due to poor diet and achlorhydria, are ably summarized in a recent article by Davies³

Objection has been raised to the theory of mineral deficiency as the cause of the anæmia on the ground that the amount of iron necessary to cure the anæmia is so very large. For this reason it has been suggested that iron acts by stimulating the bone-marrow in some way rather than by correcting a deficiency. It is true that the total amount of iron contained in the body is only some 3 to 4 grams and that the minimum effective daily dose of many preparations is very high. reduced iron, 1.5 to 3.0 grams, ferric hydroxide (Idozan) the equivalent of 1.5 to 2.25 grams of iron, and iron and ammonium citrate, the equivalent of 0.8 to 1.6 grams of iron. It should be noted, however, that reduced iron is insoluble and that the two other

preparations are *ferric* salts. On the other hand, the *ferrous* salts are active in much smaller dosage, the minimum effective daily dose of ferrous sulphate (Blaud's pill) or of ferrous chloride (Ferronyl) being equivalent to 0·1 to 0·2 gram of iron. Daily treatment with this dosage of ferrous salts may cure a severe anæmia in six weeks, when a total of 4 to 8 grams of iron will have been given.²⁴ Such a total cannot be considered very large, and it seems quite comparable to the total dosage necessary in other diseases due to deficiency, as for example the dose of thyroid in myxœdema. The maintenance dose of iron, i.e. the amount which the patient must continue to take in order to keep well when the anæmia has been cured, is not more than 0·1 gram of ferrous iron a day.

These experiments have an important bearing on our methods of treatment of these chronic anæmias. Starkenstein¹⁴ has classified the preparations of iron, of which there are over 600, as follows —

(1) Simple inorganic ferrous salts, such as ferrous sulphate and ferrous chloride

(2) Simple inorganic ferric salts, such as ferric chloride, saccharated iron, albuminate of iron

(3) Complex inorganic preparations, such as iron and ammonium citrate, and iron and potassium tartrate

(4) Organic preparations of iron, such as hæmoglobin, in which the iron is "masked"

These different groups of preparations of iron vary very greatly in potency. The organic preparations of iron, many of which are on the market, have practically no iron action. The simple inorganic ferrous salts are approximately ten times as effective as any other preparation of iron. Blaud's pill, which is sometimes regarded as an old-fashioned remedy, appears to be the cheapest and best of all the preparations of iron. To exert the maximum effect, the pills must be freshly prepared and they should be given in powdered form. I have yet to see an uncomplicated case of

chronic microcytic anæmia fail to respond to Bland's pill in a dosage of 10 grains, three times a day. Iron in this form is usually well tolerated, though it may occasionally cause diarrhoea

It is still rather a puzzle why achlorhydria or defective intestinal absorption should in certain instances give rise to a secondary or microcytic anæmia and in others to a primary or megalocytic anæmia. It is probable that the hydrochloric acid in the stomach is particularly concerned with the absorption of mineral elements such as iron and copper, lack of which produces microcytic anæmia, while the ferments are necessary for the absorption of the nitrogenous complexes which protect the body from pernicious anæmia. Absence of acid alone, *achlorhydria*, appears to be much better tolerated than absence of both acid and ferments, *achylia*. The sex and age incidence of simple achlorhydric anæmia suggests that achlorhydria alone rarely produces anæmia without the assistance of a predisposing factor, such as the strain of reproduction. *Achylia* is incompatible with health and must sooner or later give rise to pernicious anæmia.

It is not surprising that there are close affinities between pernicious anæmia and chronic microcytic anæmia. I have seen simple achlorhydric anæmia of long duration ultimately change into pernicious anæmia,²⁰ and I have seen pernicious anæmia, which had been in existence for at least three years, subsequently change to simple achlorhydric anæmia, remaining simple and microcytic in type for the last three years.²² Similar transitions, in which careful gastric analyses have been made, have been reported by Davies,³ and there is a good deal of evidence that they are due to variation in the secretion of ferments by the stomach as the result of an active gastritis. For all this, the two diseases usually breed true and remain quite distinct from one another. Subacute combined degeneration of the spinal cord is

always associated with pernicious anæmia. In patients with pharyngitis and dysphagia the anæmia is almost always microcytic. Simple achlorhydric anæmia and the allied anæmias associated with dysphagia and chronic abdominal invalidism always respond to iron and never to liver; pernicious anæmia responds to liver. In certain instances iron may also be given with advantage in pernicious anæmia, it is especially indicated when the blood-count remains subnormal in spite of maximal doses of liver.

Unexplained anæmia in men is so uncommon that it is difficult to make any generalizations about it. I have seen only eight cases of simple achlorhydric anæmia in men, in whom it is practically confined to the later years of life and old age. Rather more common is an obscure chronic secondary anæmia in young men, in which there is no dyspepsia, the tongue and the gastric secretion are normal and a good diet is being taken. I have now seen ten such cases, all of which have done well on iron and have not relapsed.²¹ All were carefully investigated and no cause for the anæmia was found. Naturally, hæmorrhage from an unrecognized ulcer of the stomach was suspected, but some of these young men have been under observation over a period of years, and in none has an ulcer developed.

In conclusion, it is interesting to look back at some words written by Fenwick⁴ over fifty years ago.

The volume of blood depends on the quantity of nutriment dissolved and absorbed by the digestive tract. If, then, in any case we should find a deficiency in the quantity of the circulating fluid where there has been no loss or undue waste of it, and where there has been a sufficient supply of food, we should naturally look for some defect in the condition of the gastro-intestinal tract to explain the emptiness of the vascular system. In the cases before quoted, along with extreme anæmia, there existed well-marked and extensive atrophy of the secreting tubes of the stomach, and it was proved in one case that the part of the mucous membrane that was tested was incapable of furnishing an artificial digestive fluid.

Defects in the food and defects in the gastro-intestinal tract are now established as two of the most important

causes of anæmia The nutritional anæmia of infancy⁷ and the anæmias which result from lack of vitamin B¹⁸ or vitamin C¹⁰—that due to vitamin B deficiency is widely prevalent in the famine areas of Africa, India, and China—are examples of anæmia due to defects in the food supply In adults in our own country gross defects in the food supply are uncommon. Usually the diet is fairly good, but its constituents may be imperfectly absorbed from the alimentary canal, and in consequence maladies such as pernicious anæmia and simple achlorhydric anæmia arise

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The Treatment of Pernicious Anæmia

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PRIOR to 1926 the almost universally adopted remedy for pernicious anæmia was arsenic. It was first employed by Byrom Bramwell in 1875, and was generally given in the form of gradually increasing doses of Fowler's solution. The initial dose was two to three minims taken three times a day after food. This was increased by a minim every other day, as long as there were no symptoms of intolerance, until doses of ten or twelve minims were attained. These were maintained for a few days and the course was then stopped for a week. William Hunter, however, preferred to prescribe small doses (two to five minims) as long as improvement was maintained, and to continue the drug in two to three minim doses for periods of months subsequent to apparent recovery. He found that cases that responded to arsenic did so equally well with the smaller doses, and there was less risk of inducing an intolerance to the drug. More recently intramuscular injection of some of the organic arsenical compounds has been used, but the injections were painful and the drug did not appear to be more beneficial when administered in this way.

The treatment, however, was capricious—not every patient responded to it, and some were intolerant to the drug. It was realized, however, that patients treated in this manner showed a larger series of remissions than did those treated by other drugs.

Some patients did extremely well with arsenic for a time, and their erythrocyte counts would approach and sometimes exceed four millions, but the improvement

was not maintained for long and sooner or later they relapsed. From the relapse recovery was not so complete, and after three or four relapses they died. Moreover, the neurological symptoms were uninfluenced and generally became progressively worse. Patients were rarely, if ever, able to return to their work once they were affected, and it was only occasionally that the disease did not end fatally, quite half died within a year of the diagnosis being made, and the rest survived for a few years at the most. In fact a patient who lived for two years was considered to have done very well. The treatment had its dangers, some patients being intolerant to arsenic developed symptoms of arsenical poisoning. Moreover, the drug was apt to accentuate the neurological symptoms.

During the last five years two remarkable changes have taken place in the treatment and the result has been that what was once a progressively fatal disease can now be relieved in such a way that patients under proper treatment return to normal health and vigour and are able to continue their occupations however laborious. Without doubt these are amongst the most important advances in therapeutics in modern times. The first of these changes was the introduction of liver diet, and the second the treatment by desiccated hog's stomach.

THE LIVER DIET

Historical.—In 1926 Murphy and Minot published their paper on the value of a liver diet in the treatment of the disease. These workers had for some years been studying the effect of diet on the anæmia, and had noticed a certain resemblance between it and sprue which was known to be due to a dietetic deficiency. At the same time Whipple and Robschert-Robbins had observed the beneficial influence of a full protein diet on blood regeneration. They compared the activity in this respect of various organs, and it was found that

liver was most potent of all in inducing the regeneration of blood after the experimental production of secondary anæmia in dogs. Murphy and Minot therefore applied this knowledge to their own researches with amazingly good and totally unexpected results. Their patients, when prescribed the diet, showed obvious benefit within a few days, and some, whose recovery was despaired of, were able to leave hospital in a normal state of health after a few weeks' treatment.

Dosage and method of administration.—In the acute stages of the disease full doses of liver are essential. Not less than half a pound must be given daily, and the best results are obtained if the liver is taken raw. It should be cut into cubes and all the juice pressed out. This can be flavoured with orange juice and is not unpalatable. The rest of the liver, which is now almost tasteless, must be mixed and eaten with the food. Not every patient, however, is able to take it in this way. Some prefer to cook the liver for two or three minutes, and provided they refrain from cooking it longer than this they respond very well, but if the liver is well cooked it becomes useless for the treatment of the disease. Full doses must be maintained until the blood-count returns to normal. The dose can then be adjusted so as to maintain an erythrocyte count of five millions with the minimum quantity of liver taken daily or every other day. For those who cannot take liver a large number of extracts are available, but these are expensive and not all are reliable.

It cannot be too strongly emphasized that the treatment must be maintained. The majority of patients will discontinue the diet or over-cook the liver if they are not kept under constant supervision. Such irregularities lead to a relapse.

Results—On this treatment the bulk of patients will show rapid improvement in general appearance and health. The yellowness and anæmia vanish, the cheeks become pink, and the patient soon feels in

normal health. The blood picture shows marked improvement, the red cells and hæmoglobin values become normal, and the colour-index falls a little below unity. A slight degree of anisocytosis always persists, and occasionally poikilocytosis too, but platelets return to normal. The early neurological symptoms of tingling and numbness of the hands and feet slowly clear up, but the treatment has no effect on the symptoms of combined degeneration of the cord once the reflexes are altered. Actually these lesions become progressively worse. Symptoms of flatulence often associated with diarrhoea tend to persist, but are invariably relieved by a mixture of three parts glycerin of pepsin and one part dilute hydrochloric acid—two drachms to be taken in eight ounces of water (flavoured with orange juice) and sipped throughout each meal.

On this treatment 50 per cent of patients regain their normal health, and a further 15 per cent could be added to that figure were it not for the persistence of neurological symptoms. Many patients (except those with cord lesions) are able to return to their work. The treatment, however, is not always successful for, although the great majority respond, there have been a fair proportion that have failed to benefit, due mainly to faulty treatment (insufficient dosage or overcooking). The presence of a septic focus has an inhibitory influence on the treatment. A careful search must therefore be made for such things as septic teeth, sinus infections, or infections of the urogenital tract, and these must be treated at the outset.

Complications—A number of complications have been recorded in connection with the treatment—acute gout, acute nephritis, uræmia, albuminuria and femoral thrombosis are the most serious, but have only been described in odd cases, generally in connection with excessive and prolonged doses of

liver.

Adjuncts.—In the acute stages of the disease, and particularly if the erythrocyte count is below a million, a blood transfusion is very beneficial. Hydrochloric acid and pepsin are necessary in about half the cases, but there is no evidence whatever that arsenic is any help in the treatment.

STOMACH PREPARATIONS

Historical—The treatment of the disease was materially influenced as a result of certain experiments reported by Castle in 1928. Working on the knowledge that the gastric juice of patients suffering from pernicious anæmia is almost invariably deficient in hydrochloric acid and pepsin, he fed such patients with beef that had been predigested in a normal stomach, and obtained results comparable with those obtained by means of the liver diet. He failed to obtain improvement with beef alone or with beef digested with hydrochloric acid and commercial pepsin. These results have suggested that in normal gastric juice there was some factor present (other than hydrochloric acid and pepsin) which was absent in cases of pernicious anæmia. Wilkinson therefore fed a patient with a daily dose of normal gastric juice and obtained a satisfactory response. A similar response was obtained by feeding patients with fresh minced uncooked hog's stomach, but as this method contained many obvious difficulties, desiccated hog's stomach preparations were subsequently used. Similar preparations were also used by Sturgis and Isaacs in America, working independently along similar lines.

Dosage and methods of administration.—Desiccated hog's stomach should be prepared by mincing the stomach and drying it at a temperature not exceeding 40°C. It is a light, insoluble, biscuit-coloured powder, and mixes well with milk, but owing to its powerful curdling activity it must be mixed immediately before

use. It can be given in a number of ways, but whichever way is chosen heat must be avoided as the active principle is destroyed. Mixed with lukewarm chocolate it makes a palatable drink, and its taste can be completely covered by mixing it with a savoury or potting it with cold cooked meat. The initial dose of an active preparation must be one ounce daily, carefully measured by weight, although in severe cases up to three ounces can be given for a short time. As the blood-picture becomes normal the dose can be reduced until the minimum dose that will maintain a normal blood-count of five million erythrocytes has been determined. This, of course, varies with the individual, but is generally about half an ounce daily. As in the case of liver this dose must be maintained, so far as we know, for life, and it is advisable to have it controlled by quarterly blood-counts. Blood-counts should also be done after illness or infection, for such conditions have an inhibitory action on treatment, often necessitating a temporary increase of dosage.

Results—The results of this treatment have been astonishing. Improvement has been noticed after three days' treatment, and the general condition and blood-count have rapidly returned to normal. In Wilkinson's series of 108 cases 92 per cent are perfectly well and free from all symptoms, whilst 6 per cent. are well, but suffer from some degree of nervous impairment, although this has much improved. They have been under treatment for periods varying from 9 to 25 months—the average being 14 months. Not one has failed to respond satisfactorily.

The earlier neurological manifestations slowly cleared up. Of eight cases with definite postero-lateral involvement of the cord and altered reflexes, three have improved so much that they have been able to return to full-time heavy manual work (one labourer and two cotton operatives), four are very much improved, but not working, and one is unchanged as regards the

nervous condition. In no case, however, did an altered reflex become normal. Gastro-intestinal symptoms did not persist as they did with the liver treatment

Adjuncts —A blood transfusion is advisable in the acute stages if the erythrocyte count is below a million. The use of hydrochloric acid and pepsin are rarely necessary, and arsenic does not appear to have any beneficial effects

Complications —No complications of treatment have so far been described.

ACCESSORY METHODS OF TREATMENT

Blood transfusion —The value of blood transfusion in pernicious anæmia has long been a debatable point, many workers in the pre-liver days considering it a valuable method of treatment with large or small amounts of blood, whilst a few considered it to be of no value at all. Probably the truth lies between these two views, and as Gulland has suggested, its real value was "to help the patient round the corner and give him a chance to recover himself" This is more than ever true nowadays when the erythrocyte count is below a million. To such cases a transfusion from a donor, whose blood has been correctly grouped with that of the recipient, improves the general condition, develops an appetite, and enables the patient to take full amounts of liver or stomach. But transfusions are not wholly innocuous and should not be done thoughtlessly. It is well worth bearing in mind that, in these cases, a transfusion of a small amount of blood gives as good a result as does a large transfusion.

Hydrochloric acid and pepsin —The importance of hydrochloric acid in gastric digestion has long been known, but its value as a gastro-intestinal antiseptic has not been sufficiently recognized. In a normally secreting stomach the gastric juice maintains the stomach contents, and probably the upper portion of the duodenum, in a relatively sterile condition. On the

other hand, impairment of acid secretion paves the way for infection via this channel. To counteract this weakening of the body's defence to infection through the upper alimentary tract, hydrochloric acid has been given therapeutically, and its use in pernicious anæmia was based upon this idea, small doses of 10–20 minims of the B P preparation being given. It was later shown that these small doses were inadequate, and that in order to maintain an acid condition in the stomach at least two drachms would be necessary given by a continuous method. In administering these larger doses of acid, well diluted with each meal, it has been found that many patients are unable to tolerate single doses of more than $1-1\frac{1}{2}$ drachms, but doses of $\frac{1}{2}$ to 1 drachm at a time, well diluted, are tolerated by nearly everyone. The effect of the acid on gastro-intestinal symptoms that are not relieved by arsenic or liver is greatly enhanced if pepsin is added to the acid and the mixture (which is detailed on p 452) sipped throughout each meal. When taken in this way it has never failed to relieve symptoms of diarrhoea and dyspepsia that are not alleviated by liver and acid alone. The acid and pepsin are rarely necessary in addition to the stomach therapy.

Antiseptic treatment—This was first introduced by William Hunter in 1890, and aimed at the complete removal of septic foci in the mouth, sinuses and elsewhere, the administration of intestinal antiseptics, and the raising of the antitoxic power of the blood by means of serum treatment. The treatment was based on Hunter's suggestion that the disease was toxæmic in origin, but although recent advances have almost certainly proved this theory to be incorrect, yet the antiseptic treatment still plays an important part in the modern treatment of the disease. Sepsis has a definitely inhibitory effect on treatment and all such foci must be eradicated. Moreover, hydrochloric acid acts almost entirely as a gastro-intestinal antiseptic,

although it has not been known to have this function until comparatively recent years. The use of vaccines and anti-streptococcal serum is still advised by some, but it is difficult to understand why.

Other methods—Other methods of various kinds have at one time or another been used. Splenectomy proved disappointing and has long since been given up. Iron has been freely used alone and in combination with the other methods of treatment. The reason for its use is rather hard to understand for there are large amounts of iron stored in the various organs of the body. It is, however, of use when a secondary anæmia has developed during the process of recovery. Red bone marrow, too, has been given in various ways on the assumption that it stimulates new blood formation, but the cases that have done best have had arsenic in addition, and there is really no evidence of its utility.

COMPARISON OF RESULTS OBTAINED BY DIFFERENT METHODS OF TREATMENT

It is interesting to compare the results obtained by the different methods. The effects of arsenical treatment, described on page 449, were decidedly disappointing. Treatment with liver produced much better results, about half the cases attaining normal health and being able to return to their work. The diet, however, tended to pall and irregularities in quantity and cooking were very liable to occur, leading to a relapse. Even better results are obtained by stomach therapy as shown by Wilkinson's statement that 92 per cent of his 108 cases are perfectly well and doing their proper work, and not a single case has relapsed after periods of treatment varying from nine to twenty-five months. Neurological symptoms, too, are benefited by stomach therapy, the earlier manifestations clear up, and even when the reflexes are altered symptoms improve. Under the old arsenic

treatment these symptoms were either uninfluenced or became progressively worse

There is another striking comparison of the results of treating the disease with arsenic, liver, and stomach preparations given in Wilkinson's paper. The figures represent the average percentage increases of erythrocytes and hæmoglobin respectively after a period of forty-five days' treatment in hospital in each case.

Treatment	No of cases	Average percentage increase in 45 days	
		Erythrocytes	Hæmoglobin
Iron and arsenic -	47	+46	+49
Liver -	33	+94	+77
Hog's stomach -	52	+157	+91

It will be observed that the rates of improvement of the erythrocyte counts and hæmoglobin values are, respectively, 1.7 and 1.2 times quicker than those obtained from liver treatment and 3.4 and 1.8 times those obtained from treatment by iron and arsenic.

Hog's stomach treatment, therefore, is undoubtedly the best treatment known for pernicious anæmia. It is quicker in its action and more certain in its cure, and does not require any adjuvant medicines. It is, moreover, the cheapest treatment known at the present time.

RETICULOOCYTES

No account of the treatment of pernicious anæmia is complete without the mention of reticulocytes. These immature erythrocytes in the acute stages of the disease are stored up in large numbers in the red marrow, giving it its characteristic red colouration. When a successful line of treatment is initiated, whether it be arsenic, liver or stomach, a flood of these cells is discharged into the circulation, reaching a maximum in about five to ten days and then rapidly decreasing. This is called the reticulocyte crisis or curve, and the determination of its presence or absence is the first method of recognizing the success or failure

of the particular line of treatment. For example, certain liver extracts and desiccated stomach preparations are not active and do not give a reticulocyte response. They are therefore useless in the treatment of the disease. The amplitude of the curve is inversely proportional to the degree of anæmia and directly proportional to the potency of the treatment

SUMMARY

The best treatment of pernicious anæmia is by means of a good active preparation of desiccated hog's stomach. At first a daily dose of one ounce is necessary, but this can be diminished later on. Subsequent doses must be sufficient to maintain an erythrocyte count of five millions, and should be controlled by quarterly blood-counts. No other treatment except the eradication of septic foci is necessary unless cord symptoms are present when some form of physiotherapy is beneficial. Such symptoms slowly improve unless there are alterations of reflexes. The treatment is yet in its infancy, but already it appears that a confident and good prognosis can be given (unless the reflexes are altered), as good as that for myxœdema, and better than that for diabetes mellitus.

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writer showed¹ that in these conditions the acidity of the plasma is normal, but the cells themselves are more acid; that is, there is a greater *difference in acidity* between plasma and red cells than in normal people. In the foetus, both plasma and red cells are more acid, the *difference* being of about the normal value. Under conditions where the plasma becomes more alkaline, the *difference* would be increased, and the state would be comparable with that found in hæmolytic conditions, e.g. pernicious anæmia. The plasma becomes more alkaline in the placenta, and still more so when post-natal respiration has commenced. It might be expected, therefore, that some degree of hæmolysis would occur in the foetus, and that this would be markedly increased after birth; in fact, that a hæmolytic anæmia would be found in the newborn, continuing till the "foetal" cells are replaced by a post-natal type. Examination of the blood of the foetus at various stages of development shows an increasing amount of bile-pigment of hæmolytic origin. Immediately after birth, this is markedly increased, the increase in bile-pigment being associated with a fall in the value of the hæmoglobin. In some cases hæmolysis is so rapid that the infants become deeply jaundiced, and such infants may become extremely anæmic. While the foetal type of red cells is in process of destruction, the marrow is engaged in producing cells of the type encountered during the remainder of post-natal life. For this purpose iron is essential, and is derived chiefly from the deposits laid down during foetal life and as a result of the post-natal hæmolysis (for very little of this is excreted). Small amounts of iron are taken into the body in the milk, the amount so derived being greater in breast-fed babies than in those artificially fed on cow's milk. Were the weight of the infant stationary, it would be possible within a comparatively short time for the original value of the hæmoglobin to be regained, but while the changes depicted above are

in process, the child is rapidly growing, and not only is a greater volume of blood necessary, but iron is required in the growing tissues of the body, notably in the muscles. An anæmia due to shortage of iron is therefore the rule in early life, and may become extremely marked if the iron deposits in the infant are low, as is the case in prematurity, or if weaning is too long deferred.

It will be seen that two forms of anæmia are encountered in the infant—an early hæmolytic form, associated with jaundice, and a later, non-hæmolytic form, due to deficiency of iron. The milder forms of these may be regarded as physiological, but not infrequently the extent of the anæmia demands treatment, and warrants the consideration of the condition as pathological. It is to be hoped that further study of these cases, which are on the border-line between the physiological and pathological, may help considerably in understanding not only the severer forms of anæmia occurring in infancy, but also those occurring at a later age.

If the degree of anæmia is allowed to become severe, growth is interfered with and the infant's resistance to infection is diminished. In the earlier hæmolytic stage, hæmolysis may be inhibited by the injection of human serum in the manner which has been advocated in the treatment of *icterus gravis neonatorum*; this object is, however, equally well attained by means of transfusion, which has the added advantage of introducing the much-needed red cells. Much more important in the majority of cases is the later non-hæmolytic stage, and here the necessity for the administration of iron will be readily understood, the iron may conveniently be given in the form of iron ammonium citrate, which can be given in the milk in the case of artificially fed babies, and is well borne in comparatively large doses—up to 15 grains in the day—though it is wise to commence with smaller doses.

It has been suggested that hæmolytic anæmia may

condition suggests Hodgkin's disease, and the latter diagnosis must be carefully considered. It is probable that the picture is one of a composite group, but practically nothing is known of the etiology. The anæmia is associated with pyrexia, which may suggest infection, but none can be discovered, except near the end, when it appears to be secondary to a lowered resistance. In prognosis, the degree of the reduction in white cells and platelets appears to be of significance. Treatment, however, is seldom of any avail, a few improve spontaneously, but the majority proceed to a fatal issue. Of all the anæmias encountered in childhood, apart from those associated with such conditions as malignancy, this is the most uniformly fatal and is the least understood. In a number of cases there is a history of slight anæmia for years, perhaps if this were generally realized, and such cases were treated more energetically in the earlier stages, the onset of grave aplastic anæmia might become rarer.

Some degree of anæmia is often associated with metabolic disorders. That occurring in thyroid deficiency may be very marked, and the condition is probably more often overlooked in the child than in the adult. With the administration of thyroid extract, improvement is rapid. It is particularly the metabolic disorders of dietary origin, however, which tend to escape attention when the origin of an obscure anæmia is under discussion. In rickets and in scurvy, the degree of anæmia may be severe. Where obvious changes are present in the bones or gums, the condition usually receives treatment, and improvement in the blood follows that of the general condition, it is in the lesser degrees of vitamin deficiency that treatment is so often withheld. It is generally realized now that the amount of the accessory factors required varies with the composition of the diet, especially with the proportion of carbohydrate incorporated in it. Children fed with excess of starch are often anæmic, though in

this instance it is necessary to take into account the extra amount of water which is retained in the body. In the fuller diet of a later age, deficiencies are not so likely to occur; it is in the child that anæmia of the type under consideration has its maximal incidence.

Other forms of anæmia occurring in infancy and childhood are not sufficiently dissimilar from the corresponding conditions occurring in later life to warrant a separate description, beyond stating that in infancy there is a tendency to considerable enlargement of the spleen, and the blood picture may show a high white count, with a relative and actual lymphocytosis, and fairly numerous myelocytic forms and nucleated red cells—the picture described by von Jaksch as “pseudo-leukæmia infantum” Some authorities consider this picture to be that of a definite disease of infancy, but the majority prefer to regard it as illustrating a type of infantile reaction which is present in a number of different disorders—a view for which there is considerable evidence.

In conclusion, it should be stressed that in the treatment of all the anæmic conditions of infancy and childhood, attention to general hygiene, the supply of sunshine and fresh air, and a carefully balanced diet containing an adequate amount of vitamins and inorganic constituents are of the greatest importance.

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On Glandular Fever or Infective Mononucleosis

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GLANDULAR fever or infective mononucleosis is an infectious disease first described by Pfeiffer in 1889. It usually occurs in children and young adults and is characterized by an acute onset with malaise, fever, and later enlargement of lymphatic glands—more particularly the cervical lymphatic glands. The disease appears to occur in small epidemics although sporadic cases are found. This article deals with the epidemic in London in April and May, 1930, and particularly with 27 cases admitted to the London Hospital at that time.

HISTORY AND LITERATURE

Pfeiffer described the disease as it occurs in children, pointing out the infectious and epidemic nature of it. In his cases the onset was sudden with fever up to 101° to 103° F and on the second or third day of illness the cervical lymphatic glands became enlarged. The spleen was palpable in the majority of his cases and the fauces were reddened and injected though usually without exudate. He pointed out that hæmaturia was not an infrequent complication. Although in general the disease tended to run a benign course, the patient invariably recovering, the convalescence was apt to be prolonged. In his paper, however, there was no account of the blood picture of the condition. The matter rested here and it was not until about 1920 that the relation of this disease of Pfeiffer to the condition of infective mononucleosis described in America by Longcope, and by Sprunt and Evans, and

by Tidy and Morley in this country, was realized.

Sprunt and Evans, in 1920, described six cases of what they termed infective mononucleosis : a disease in many ways similar to the glandular fever of Pfeiffer except that it occurred in adults. They gave a very full account of their cases but it was reserved for Tidy and Morley in 1921 to describe in detail the blood picture occurring in this disease. Prior to this time, as pointed out by Tidy and Morley, descriptions of this disease had occurred under such titles as "Acute lymphatic leukæmia with recovery" and "Pseudo-leukæmia."

Sprunt and Evans came to the following conclusions about their cases of mononucleosis in adults. The symptoms and signs in these cases showing a mononucleosis in the blood were so much alike that the group might be considered provisionally as a clinical entity. This mononucleosis of adults as a reaction to acute infection was not a simple lymphocytosis, as in children, but was made up largely of pathological forms probably all lymphoid in origin. When first seen, during the febrile period, these cases could not be differentiated with assurance from leukæmia but the subsequent course made the diagnosis clear. The prognosis was good, all these six cases recovered.

Tidy and Morley, in 1921, and Tidy and Daniels, in 1923, came to the conclusion that the glandular fever of Pfeiffer and infective mononucleosis of Sprunt and Evans were identical diseases. These authors gave an account of an epidemic occurring in a boys' school. They considered that the incubation period was about seven days and that the infectivity of patients lasted 10 to 14 days after the acute attack. They point out the differential diagnosis of the disease and stress the mild constitutional disturbance which accompanies it, in sharp contrast to the acute leukæmias with their grave constitutional upset. No evidence of hæmaturia occurred in their cases, which were all characterized by :

(1) Absence of anæmia; (2) rapidity of glandular enlargement; (3) mildness of constitutional symptoms

Similar cases were described in America by Longcope, who found the spleen palpable in three-quarters of the cases and the maximum leucocyte count was 23,000 whites, ninety-five per cent. lymphocytes, whereas in Tidy and Daniels' series their maximum was 25,000 whites, with eighty-five per cent of lymphocytes. Bloedorn and Houghton described four cases in which the spleen was not palpable in any, although in two the spleen was enlarged to percussion. Cottrell described twelve cases between 18 and 26 years in whom males outnumbered females by eleven to one. Cottrell's cases were interesting, for seven out of twelve showed sore throats and from six out of the seven the spirillum and fusiform bacillus of Vincent's angina were isolated. Baldrige, Rohner, and Hausmann, reviewing fifty cases of infective mononucleosis from Iowa College Hospital, U S A, examined swabs from the throats of twenty-nine of the fifty sufferers, and in twenty-seven out of the twenty-nine organisms of the Vincent's angina type were found, while in fifty-five medical students, normal in every other way, forty-seven out of the fifty-five showed the presence of these organisms when swabs were taken from their gum margins and throats. From this we may be led to infer that these organisms are not of direct significance in the causation of glandular fever.

From what has been said, then, we may conclude that glandular fever and infective mononucleosis are one and the same disease, the first title being used in the past to denote the disease as occurring in children, the second the same disease occurring in adults.

EPIDEMIC IN THE EAST END OF LONDON

This epidemic shows some unusual features. It began about the middle of April, 1930, and from that time until the end of May, 27 cases were admitted

to the London Hospital, and it is with these cases that the present paper is concerned. The incidence among members of the same family was remarkably low, only in one instance were two members of the same family (two brothers) affected. This fact was noted also among cases of the same epidemic in the London Jewish Hospital and in St. Bartholomew's Hospital (see Evans and Robb, also Krestin). Evidence incriminating certain districts or contact with other sufferers from the disease could not be obtained. All these cases in the London Hospital were nursed in the general wards without the spread of infection in a single instance. The disease, therefore, is not very contagious.

The ages of practically all these twenty-seven cases fell between 18 and 26, although there was one case aged 8 and another aged 49. The proportion of males to females affected was fifteen to twelve. Twenty out of the twenty-seven cases occurred among the Jewish race but this may be accounted for by the area served by the London Hospital. No real evidence of the true incubation period was obtained, but it appears to be about 14 days and may be as long as 3 weeks.

ETIOLOGY

Of the cause of the disease but little is known. That there is, probably, an infectious process at work can hardly be doubted. The course of the disease and the fact that it occurs in epidemics is in support of this view. As already mentioned, Vincent's angina organisms have been isolated from the throat in some cases, whereas other authors regard the condition as due to a streptococcal infection of the tonsils and pharynx. The epidemics of glandular fever have all occurred in the early spring months of the year, when the incidence of diseases of the upper respiratory tract is most prevalent.

An important contribution towards the etiology of

(1) Absence of anæmia; (2) rapidity of glandular enlargement; (3) mildness of constitutional symptoms

Similar cases were described in America by Longcope, who found the spleen palpable in three-quarters of the cases and the maximum leucocyte count was 23,000 whites, ninety-five per cent lymphocytes, whereas in Tidy and Daniels' series their maximum was 25,000 whites, with eighty-five per cent of lymphocytes. Bloedorn and Houghton described four cases in which the spleen was not palpable in any, although in two the spleen was enlarged to percussion. Cottrell described twelve cases between 18 and 26 years in whom males outnumbered females by eleven to one. Cottrell's cases were interesting, for seven out of twelve showed sore throats and from six out of the seven the spirillum and fusiform bacillus of Vincent's angina were isolated. Baldrige, Rohner, and Hausmann, reviewing fifty cases of infective mononucleosis from Iowa College Hospital, U S A, examined swabs from the throats of twenty-nine of the fifty sufferers, and in twenty-seven out of the twenty-nine organisms of the Vincent's angina type were found, while in fifty-five medical students, normal in every other way, forty-seven out of the fifty-five showed the presence of these organisms when swabs were taken from their gum margins and throats. From this we may be led to infer that these organisms are not of direct significance in the causation of glandular fever.

From what has been said, then, we may conclude that glandular fever and infective mononucleosis are one and the same disease, the first title being used in the past to denote the disease as occurring in children, the second the same disease occurring in adults.

EPIDEMIC IN THE EAST END OF LONDON

This epidemic shows some unusual features. It began about the middle of April, 1930, and from that time until the end of May, 27 cases were admitted

these lymphatic reactions may be due to an unusual constitutional disposition on the part of the patient to the onslaught of an acute infection. In our view this is probably not the case in glandular fever, as is shown by the fact that in one of Cottrell's cases and in our case complicated by broncho-pneumonia, acute septic infection supervened during the lymphocytosis and the patient's bone marrow reacted normally by a polymorphonuclear leucocytosis.

We are, therefore, thrown back on the supposition that the monocytic reaction is the special manifestation of the particular infecting organism. At the same time, it is hard to understand how it is that the outpouring of large numbers of lymphocytes, which are of no known value in combating the effects of most infections, is of biological advantage to the patient in overcoming this infection.

CLINICAL MANIFESTATIONS AND COURSE OF THE DISEASE

Onset.—The onset of the disease and manifestations of the case before the enlarged glands appear varies greatly. Usually the onset is acute with general malaise, headache (frontal or occipital radiating down the neck), and fever. Two cases showed photophobia and in half the cases there was slight sore throat. In one case hæmaturia occurred at the onset. This is of interest since hæmaturia has been described as a complication of glandular fever but in no other cases did this occur. At or soon after the onset the face becomes flushed, the mouth dry and the tongue furred. In a number of the cases the tongue was somewhat œdematous, particularly at the edges, which tended to be indented by the adjacent teeth.

Additional manifestations of the disease at the onset were epistaxis in two cases, pulmonary collapse at left base simulating pleural effusion in one case, and

skin rashes in six cases. Of the rashes two were erythematous in type confined to the trunk, lasting 3 days, one a faint macular rash over the trunk on the fifth day of illness lasting 2 days, one urticarial rash lasting 24 hours and two cases of a diffuse scanty papular eruption somewhat resembling the rose spots of typhoid fever.

Glandular enlargement — After a variable period from the onset, which is usually between 10 and 14 days, but may be as long as 3 weeks and as short as 3 days, enlargement of lymph glands becomes apparent. The glands mostly affected are those in the anterior and posterior triangles of the neck. In no case was the parotid gland or the submaxillary salivary gland enlarged, a point of importance where the diagnosis of mumps enters as a possibility. In the majority of cases the glands on one side of the neck appeared first, generally followed a few days later, but to a less extreme degree, by the glands of the other side. The rapidity with which the glands enlarge is a remarkable feature. In one case (F.F.) an occipital gland, from not being palpable, became the size of a small walnut in 24 hours. The glands are somewhat tender though not painful, they are discrete, rubbery to the feel, and the skin is not reddened over them. In no case did suppuration occur. The glands affected were generally the occipital and cervical, although in one-half of the cases other lymphatic glands were also enlarged. Ten cases showed enlargement in the axilla, five in the inguinal region, two epitrochlear glands on one side, and indirect evidence led one to believe that the mediastinal glands were enlarged in one case and the mesenteric glands on the right side in another.

In two cases glands were excised and examined microscopically and, as reported upon by Professor Turnbull, showed the following Hyperplasia of the reticulum and the germ centres of Flemming, and the

whole gland contained a very greatly increased number of lymphocytes. In one case Dr Bland was able to infect rabbits with the citrated blood of a sufferer, producing in rabbits what he terms "experimental glandular fever."

Though the lymphatic glands appear rapidly, yet they disappear slowly. For instance, in one case which was followed up, the glandular enlargement persisted for more than five months after the febrile attack. This is the more remarkable since the blood count had returned to normal $2\frac{1}{2}$ months previously.

The respiratory rate—This was but little altered except in the one case, described below, in which pulmonary signs ushered in the disease.

The pulse—At the onset, and for that matter throughout the febrile period, the pulse was regular, full, and of good tension. The pulse-rate, however, was in uncomplicated cases slower than would have been expected in view of the temperature. Thus, a pulse-rate of 92 with a temperature of 102° F. was the rule rather than the exception.

Temperature—At the onset of the disease the temperature rapidly rose and a temperature of 103° F. was frequently found in the severe cases. As a rule the temperature remained high for four or five days, then it commenced to remit in the mornings only to rise again in the evenings. This remittent temperature from 99° in the mornings to 100° or 101° F. in the evenings would continue for a fortnight or three weeks, and in one case for as long as six weeks. In spite of this remitting temperature the patient felt bright and cheerful—a striking feature of the disease.

Fauces—In twenty-four of the twenty-seven cases the fauces were red and injected, but in no case did exudate appear. Unfortunately, the spirillum and fusiform bacillus of Vincent were not looked for, so we were unable to confirm the investigations of Cottrell,

below.—

Patient		Wassermann.	Kahn		Sigma
R	W	±	+	+	0 75
F	F	negative	+	+	0 0
E	W	±	+		0 0
M	S	±	+	+	0 0
H	W	negative	+	+	0 0
H	L	±	+	+	0 86
J	W	±	+		0 0
J	E	+	+	+	Infected serum

± denotes incompletely positive reaction, 10 serum is slightly anticomplementary

It seems that the reacting body in the serum may possibly be the acetone-soluble fraction present in the Kahn test but not in the Sigma. That the Wassermann reaction may be positive in glandular fever was confirmed by Parkes Weber

In one of our cases two intravenous injections of 0.3 grammes of novarsenobillon were given at a week's interval without any immediate effect upon the temperature or the Wassermann reaction, although the Wassermann reaction returned to negative spontaneously in these cases 6 weeks to 2 months after the acute attack. No pathogenic organisms were grown from the urine or stools in any case.

Progress and prognosis.—After the acute attack, which may last from 7 to 10 days, the patients feel better and regain their bright and cheerful outlook in spite of the continuance of the intermittent temperature, which often persists for 2 to 3 weeks, and in one of our patients for 7 weeks after the acute symptoms had disappeared. In two cases temporary relapses occurred and were usually associated with the appearance of a fresh glandular enlargement and rise of temperature. Such a case is as follows.—

S S, aged 16, single. Admitted to the London Hospital on April 30, 1930. Fourteen days prior to admission became suddenly feverish, sneezed, and coughed, went to bed, for the next few days, felt feverish every evening. Nine days before admission he had a severe nose-bleeding. Six days before, a papular rash appeared, he was sent to a fever hospital as small pox, vaccinated

and discharged *Past history* nothing of note *Family history* no similar illness in the family *On examination on admission* Face flushed, tongue furred, slightly cedematous at edges Fauces injected Temperature, 104° Pulse, 114 Respiration, 28 Enlarged, slightly tender, discrete, rubbery lymphatic glands behind the right sternomastoid and in the left axilla On the fifth day in hospital, patient felt better and was bright and cheerful, the temperature from oscillating between 103° F in the evening to 99° in the morning changed to 100° in the evening and 99° in the morning This state lasted for three days when the temperature suddenly rose again to 103° and a large gland appeared the size of a small walnut on the left side of the neck The temperature returned again to 100° in the evening and 99° in the morning after five days and remained of this type for a further ten days when it gradually settled down to normal No enlargement of the spleen

B P $\frac{130}{85}$ mm.Hg Widal negative Urine trace of albumin for first five days after admission No pathogenic organisms in the urine or stools *Wassermann reaction* incompletely positive

<i>Blood counts</i>		1 5 30	16 5 30	30 5 30
Reds - - -		5,000,000	4,500,000	4,800,000
Hæmoglobin - -		80	68	75
Colour index - -		0.80	0.75	0.78
Leucocytes - - -		9,320	9,520	6,200
Polys - - -		53.5%	50%	66%
Large and small lymphocytes -		43%	43%	28%
Large hyalines -		25%	6%	5%

The glands of the neck were slightly tender for the first fortnight in hospital On discharge from hospital (6.6.30), the cervical glands were still enlarged but no longer tender

This case well illustrates the many characteristics of the disease Apart from one patient who developed broncho-pneumonia at both bases eight days after admission to hospital and subsequently died, we have not observed any complications of importance One case subsequently developed pitting cedema of the right lower limb which might have been due to pressure of the right iliac glands upon the right iliac vein; on the other hand, it may have been merely an idiopathic thrombosis of the right femoral vein The condition rapidly cleared up The anæmia stressed by Tidy and Daniels as an after-effect in their cases was not observed in our cases. The immediate and remote prognosis in glandular fever, therefore, appears

to be good.

DIFFERENTIAL DIAGNOSIS

During an epidemic the diagnosis of glandular fever offers few difficulties, but apart from epidemics, which are uncommon, there can be little doubt that in the past these cases have been overlooked or regarded as an anomalous form of leukæmia. An interesting incident of the recent epidemic was reported by J D Rolleston and Radford, two cases of glandular fever were thought to be typhus on account of the rash which appeared in the early stages

In one of our cases, a young women aged 22, the disease presented itself by pain and tenderness in the right iliac fossa with fever, a furred tongue and constipation, with the result that she was operated upon for acute appendicitis. Enlarged cervical lymph glands appeared three to four days after the operation. In another case, collapse at the base of the right lung was the presenting sign, and it was regarded as a case of ordinary pleurisy. Apart, however, from these anomalous cases glandular fever has to be differentiated from .—

(1) *The acute specific fevers* —(a) Mumps The glandular enlargement in the neck may simulate mumps although on careful palpation it will be found that, unlike mumps, the parotid and submaxillary salivary glands are not affected. In addition, lymphatic enlargement may occur in the axillæ and groins, and, as in eight of our twenty-seven cases, the spleen may be clinically enlarged. As, however, a lymphocytosis occurs in mumps, the two diseases may, at first sight, be confused

(b) Rubella: Although in rubella there may be enlargement of the cervical and occipital lymph glands with a rash at the onset, these persist only for a day or two. In glandular fever the palpable glands may persist for months. A lymphocytosis is said to occur

also in this disease, though not to such an extent as in glandular fever.

(c) *Enteric fever* A large number of the cases when first seen were admitted to hospital as typhoid or paratyphoid B, and the resemblance may be very great in the absence of noticeable glandular enlargement. However, the progress of the case made the differential diagnosis clear and this was confirmed by serum reactions, absence of pathogenic organisms in the excreta, and sterile blood cultures.

Diagnosis of influenza or *B. abortus* infections could be ruled out fairly easily.

(2) *Acute lymphatic leukaemia*—The clinical picture of fever, enlarged lymphatic glands, and a large excess of lymphoid cells in the blood, is very suggestive of acute lymphatic leukaemia. There are, however, a number of points of distinction. In leukaemia the patient is gravely ill with severe constitutional disturbance, hæmorrhage into mucous membranes, and anæmia. The absence of these grave signs is one of the characteristics of glandular fever; all our cases, of glandular fever, save one, recovered.

(3) *Chronic septic and tuberculous lymphadenitis*.—The presence of a septic focus in the tonsils or teeth, as a cause of the lymphatic enlargement, has to be thought of, but when the presence of glandular enlargement elsewhere in the body, with a lymphocytosis and possibly splenic enlargement occurs, the similarity between glandular fever and chronic septic lymphadenitis is not very close. In addition, in none of our twenty-seven cases did suppuration occur in the enlarged lymphatic glands.

(4) *Acute Hodgkin's disease*—Acute Hodgkin's disease may simulate glandular fever very closely in some phases of its course. The blood picture and the course of the illness will help to differentiate the two diseases. If doubt still exists, excision of a gland with histological examination is the most certain way

of excluding Hodgkin's disease.

TREATMENT

The treatment of the complaint is mainly symptomatic since we know little of its underlying cause. The patient should go to bed till the fever has subsided and hot fomentations may be applied to the enlarged glands to relieve pain if necessary. Salicylates reduce the fever temporarily, and astringent gargles and mouth washes may be given for the sore throat. We have tried arsenic given intravenously, also by the mouth as Fowler's solution, without any apparent effect upon the course of the disease.

SUMMARY

(1) An account is given of the disease, glandular fever or infective mononucleosis with special reference to twenty-seven cases of the disease admitted to the London Hospital in April and May, 1930.

(2) The infectivity and distribution of the epidemic is discussed. The only cases occurring among members of the same family were two brothers aged 21 and 24 respectively.

(3) The microscopical appearance of the glands and the peculiarities of the blood picture are described.

(4) Reasons are given for believing that the disease gains admission to the body through the throat and that it is due to a filter-passing virus.

(5) The positive Wassermann reaction occurring frequently in this disease is commented upon and comparisons made of this test with the Kahn and Sigma serum tests in the disease.

(6) The differential diagnosis from the acute specific fevers, acute leukæmia, enteric, Hodgkin's disease, and chronic septic lymphadenitis is discussed.

It is my pleasant duty to acknowledge my indebtedness to the Honorary Medical Staff of the London Hospital for permission to include, in the present

article, the cases under their care.

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The Value of Tryparsamide

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THE sodium salt of N-phenylglycineamide-parsonic acid was originally known as A 63, "being the sixty-third of a series of two hundred and forty-three arsenicals" prepared by the Rockefeller Institute, and the name tryparsamide was given to it in 1920. Considerable success followed the use of the drug in the treatment of trypanosomiasis in the tropics, and the Institute has, for some years past, granted the right to manufacture and sell tryparsamide to certain commercial firms, receiving no income whatsoever for the granting of a licence, and retaining a strict control over the manufacture and sale of the drug in the interests of the public. While the original purpose of tryparsamide was for the treatment of sleeping sickness, in the past few years its field has been extended into other conditions, and it has been largely used in the treatment of the late results of the *Spirochaeta pallida*. It seems to have no beneficent action whatsoever in the early stages of syphilis, and is not now used in this condition.

It is not used to the extent it might be, as it is regarded as a "specialist" drug and there is a general impression that it must not be given except under hospital conditions, an impression which has grown up partly because the results of its use are not fully known or appreciated, and partly because it is of use in comparatively few states. Tryparsamide, as in the case of all the arsenical preparations, must be given with the greatest possible care, and it has the further disadvantage that it cannot be given by the mouth, apart from this, it can be used with safety provided a

another with the tryparsamide, but this has not been my recent practice, nor has it seemed advisable to use bismuth in any form, and a comparison of results shows but little indication for anything but the tryparsamide alone, whilst the additional intramuscular medication tends to cause the patient discomfort. On the other hand, when the drug has been well tolerated and results seem satisfactory after the course has been finished, an intermittent course of potassium iodide has, frequently, a beneficial effect and seems to help the remote effect of the arsenical

Contra-indications are rare in tabes and will be discussed later, but it may be well to mention that the condition of the optic nerve should be considered in advanced cases. It would be foolish to claim that intensive treatment by tryparsamide will restore vanished reflexes, but in the early and well-defined case of tabes dorsalis it undoubtedly adds to the comfort and well-being of the patient from the physical side, and tends to prevent the insidious spread of the condition as evidenced by repeated lumbar puncture at varying intervals. It has, in addition, the advantage of being shown increased toleration, so that following courses have seldom any ill-effect.

General paralysis of the insane — If one were asked to give a personal opinion of the efficacy of tryparsamide in this condition one would have to confess that *per se* the drug is of much less value than treatment by induced malaria. This is a hotly debated point and many would strongly disagree. Even those who are most enthusiastic in their advocacy of the malarial treatment, however, would hesitate to withhold tryparsamide after malaria, and many feel that a course of the drug antecedent to the pyrexial attacks is the ideal method. Silverston¹ is somewhat doubtful as to the assessable value of tryparsamide following malaria, whilst others claim that the benefit of the pyrexia is

heightened by the early institution of the drug therapy.

There is a very real place in the treatment of general paralysis of the insane for tryparsamide, where the patient is showing epileptiform seizures before or after malaria it is the rule, rather than the exception, to find that a short intensive course of tryparsamide will prevent their repeated occurrence. That this is due to the penetrability of the drug is suggested by the fact that no betterment is obtained by its use in true epilepsy. The tonic effect is also of great value, either before or after malaria, and the devitalized patient can often be brought into a physical condition compatible with the strain of pyrexia by the use of tryparsamide, which seems at least to halt the progress of the disease until malaria is used.

It has not been proved that induced malaria can be terminated, or indeed averted, by the use of tryparsamide, and parasites remain in the blood until quinine is administered in spite of the fact that the arsenic preparation is being given. Cases treated by tryparsamide alone do not respond so quickly, if at all, and the percentages of "remission" and "amelioration" are much in favour of malaria followed by tryparsamide.

Paralysis agitans—Tryparsamide is not suggested in the treatment of this condition, but it has seemed suitable to use it in an endeavour to alleviate the distressing tremor, and one has found that results have been rather more satisfactory than expected in a few cases. In order that no case of specific disease has been wrongly classified as *paralysis agitans* one has always made exhaustive investigations into the condition of the blood and cerebro-spinal fluid, and even the slightest doubt has precluded such classification.

Perhaps the tonic effect of the intravenous administration of the drug has had some steadying influence on the nervous state, but one feels that definite benefit

has accrued in a percentage of cases responding to nothing else, and on whom hyoscine had unpleasant effects. The tremor of the hands is not completely overcome, but there is a marked increase in the latent period. that is to say, the strong rhythmic tremors do not start so early in conscious effort, and the patient is infinitely more able to control the hands from that standpoint. Whilst there is little or no real improvement in the gait, the health of the patient tends to improve markedly. So few cases of Parkinson's disease have come my way that it is unfair to generalize, but tryparsamide seems to benefit at least a few, there are seldom complications in this condition granted that the sufferer is not elderly.

The tonic effect—A marked increase in the well-being of the patient is found in practically every case and commences from the early doses. As with the rest of the arsenicals, the toxæmic conditions which show on the skin are readily benefited, and there is a general toning up of the whole system, especially in those who have suffered from devitalizing nervous conditions. Appetite and weight increase, and the physical state in general improves.

The blood picture is an interesting one, tending first to an increase in the leucocytes, especially polymorphous, and then to a gradual diminution to the accepted percentages, just prior to which the evidences of toxæmic anæmia begin to leave the red cells which lose their pallid centres. By the end of the course the patient usually looks, and feels, infinitely better and the auto-intoxication is markedly improved provided, of course, there is no seat of focal infection.

Method of medication—Of the two routes, intravenous and intramuscular, the former would seem to be that of choice, and is no more difficult than the latter. Indeed, owing to the tendency for minor pain to occur if the drug is introduced below the skin,

it is the general practice to give tryparsamide direct into the veins. Sterile ampoules are obtainable, containing various doses, and there is but little preparation necessary beyond strict asepsis of skin and instruments. Sterile distilled water of room temperature should be used to dissolve the drug.

Care should be taken to ensure that the point of the needle is actually in the vein, and the injection should be given slowly to correspond with the blood flow. If the veins do not show up well, a tourniquet may be necessary. Immediately the needle is withdrawn a sterile swab should be placed over the area of the puncture and the arm flexed over it. Provided this is kept in position for a moment or two no further attention is necessary, and it is inadvisable to use iodine either before or after the injection as reddening of the area may occur.

Dosage.—The dose usually employed as a maximum is 3 grams by weekly injection, and this can be given from the commencement, but in the devitalized case it is often advisable to commence with a small amount, say 1.5 gram, and work up by increases of 0.5 gram until the large dose has been reached. The concentration of the drug per c cm. of sterile distilled water has some effect on the patient's tolerance, but it is a pretty safe rule to dissolve the smaller doses in 4 c cm per gram, using 10 c cm for the last two amounts. From 24 to 30 grams of tryparsamide constitutes a full course, and the number of weekly injections is generally from eight to twelve. After the termination of the first course it is advisable to give some two months rest, and if the indications exist, to commence another series of injections with the maximum tolerated dose. Where tryparsamide is being given for neuro-syphilis it is of considerable help to fill in part of the waiting period with potassium iodide.

Contra-indications to tryparsamide.—Three main

reasons are found for withholding treatment by tryparsamide—namely, the presence of ocular lesions, including those arising from nephritic conditions, the risk of hepatic insufficiency, and any acute febrile disease. An examination of the optic disc should always precede the commencement of a course of injections, as amblyopia is the chief complication to be considered and the one fairly frequently found. It is found where the neuro-syphilitics are of a somewhat advanced stage, and much less frequently in the early cases. If there is a tendency to jaundice, tryparsamide should not be used, or should only be used in small, graduated doses, and even then with the greatest of care, as it undoubtedly throws some slight strain on the hepatic functions.

Complications.—Nitroid crises have been reported by those working with tryparsamide in sleeping sickness, and Silverston reported one such case in a neuro-syphilitic. Vomiting, collapse, loss of consciousness and slowing of the pulse were found, but these reacted to adrenalin. Laigret² compares this condition to the immediate benign reactions to the arsenobenzols. Much more common is the onset of slight malaise and rise of temperature within the first twenty-four hours, but with rest these pass off, and they can usually be avoided by the use of the graduated dose.

If eye symptoms develop it is advisable either to stop the administration of the drug altogether, or to revert to a much smaller dose and work up very gradually. Whether the condition arises from the toxic action of the arsenical on the optic nerve, or whether it is due, as suggested by Pearce and Brown,³ to the resolution and healing of the optic structures, one does not know, but when amblyopia develops it is an indication to use the very greatest care, even though the state is but transitory in the majority of cases.

Jaundice is rarely found, but is a definite indication

that the patient is unable to tolerate the drug. Herpes zoster is sometimes found as a sequel in tabetic patients, even though their general health is quite good, and if this should be found it will terminate the course, or, if evidenced in the rest period, will delay the commencement of a second course for some little time after all herpetiform manifestations have gone. In tabes one occasionally finds an urticaria spreading from near the sight of the injection which may become widespread and irritable, but which reacts somewhat slowly to treatment.

Conclusions—Provided that tryparsamide is given under proper care and supervision it is of very definite use for its tonic effect, and also for its benefit in the neuro-syphilitic conditions. Its effects are both tonic and ameliorative, and although particularly useful in tropical diseases, it has been used extensively in other spirochætal conditions with success, whilst it has given results in other nervous conditions by reason of its tonic properties.

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The Treatment of Streptococcal Septicæmia

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IT cannot be stated too insistently that in the treatment of septicæmia time is everything, and for oral administration there exists no drug which is of the smallest specific benefit in the disease. Every day wasted in such treatment only ensures that the potential resistance will decrease steadily, and it is upon this passive reserve of resistance that recovery from every infective disease depends. It is also true that the earlier and more thoroughly the disease is treated the more rapidly will the patient improve.

A type of case which exemplifies this fact is that form of septicæmia which follows the puncture of a finger with some highly septic instrument or appliance. Few conditions can develop with such appalling speed. Adenitis, lymphangitis, a very high temperature, rigors, and even the commencement of a muttering delirium may all develop within 36 hours or less of the injury. Prompt treatment with an appropriate residual vaccine will produce a cure with equal celerity. In such a case treatment limited to hot fomentations is futile since the infection has passed beyond the reach of local treatment.

At the first examination of the patient attention must be directed to making a clinical diagnosis of the probable causal organism. The original lesion—surgical, medical, or gynæcological—must be considered from the standpoint of its liability to discharge fresh waves of infection into the circulation.

From the general condition a clinical estimate

of the probable reserve of resistance must be made. At the same time cultures should be taken from the blood and if possible from the original lesion. a blood count should also be done. The culture may require three or four days' incubation before the organism can be recognized, and if academic considerations cause all specific treatment to be withheld until the result is known, a fatal issue may well be determined. For this reason the bacteriologist must be prepared to make an immediate clinical diagnosis, subject to future correction, of the identity of the causal organism in order that he may proceed at once with the appropriate treatment. In practice this will commonly lie between the streptococcus and staphylococcus, with the pneumococcus as a third possibility in certain cases. If the original lesion can be reached examination of a stained film will probably give an indication.

The examination of the general condition should be directed to such matters as the renal efficiency as manifested by pathological changes in the urine. The possibility of failure of glucose metabolism is a serious consideration, and it is wise to reserve a small proportion of the blood withdrawn for a blood sugar estimation. The position of the lower limit of hepatic dullness will give a rough indication of the amount of damage that the hepatic tissue has already sustained, and therefore of the share it is likely to take in antibody production. This aspect of the case will be mentioned again later.

As a source of future trouble the respiratory tract should not be overlooked. Pneumonia, with a proportionately grave prognosis, may be already present, or a slight cough may indicate a commencing tracheitis, possibly due to an anæsthetic. If tracheitis be present no time should be lost in exhibiting a good expectorant mixture since danger threatens from two points the infection may spread

downwards and pass into bronchopneumonia or an incessant dry cough may prevent sleep and constitute the last straw to cardiac muscle already damaged by a virulent toxæmia. The great influenza epidemic is a sufficient lesson on the syndrome, tracheitis—insomnia—heart failure

The observer should note the patient's mental state. If he appears to be definitely unbalanced the cause may be toxæmic, in which case the matter is not necessarily grave. But it should not be forgotten that ulcerative endocarditis frequently produces mental abnormality, maniacal or epileptiform, and the fact that no valvular lesion can be detected clinically does not disprove the diagnosis. A rational and alert mind does not usually accompany a hopeless streptococcal case. For some reason in a fatal staphylococcal infection the mind may on the other hand remain alert to the end. The eye is probably the best single indication of the depth of a toxæmia. An apathetic eye with a drooping lid indicates either a profound toxic state or lack of sleep. A clear and alert eye, interested without being restless, is a hopeful sign. It will be seen that the examination is directed throughout not to diagnosis, or even prognosis, so much as to acquiring data for the plan of treatment that is to be put into operation.

It will make for clarity if the various measures employed are described separately. The first remedy to be used is the appropriate stock residual vaccine. Its special type has been described elsewhere¹. A dose of this is given, and if the temperature has not fallen within 24 hours a second dose, equal to the first, is injected. The strength of the vaccine is such that it causes no noticeable reaction. No further vaccine should be given for four days, when an autogenous residual vaccine from the blood culture or local lesion should be ready for use. This latter vaccine should also be of very low strength. Patients

acutely ill do not require, and can be harmed, by the comparatively large doses suitable for more chronic diseases. It is also unnecessary to increase the dose at each injection. If the temperature remains close to normal the vaccine can be given at weekly intervals for two or three weeks. If the temperature tends to swing the injections should be given at four-day intervals. The dose of these subsequent injections is determined by the amount required to produce an effect at the first administration.

Antistreptococcal serum alone is of dubious value in septicæmia, but it appears to be of definite value if given 24 hours after a dose of vaccine when the temperature shows a tendency to fall due to the antibodies produced as the result of the antigenic stimulus. If the degree of improvement that follows the double measure is not satisfactory a further quantity of serum should be given next day. The amount of serum administered at a dose should not be less than 50 c cm. for an adult. The fact that antisera are usually put up in 10 c cm containers is unfortunate, since it is apt to suggest to the uninitiated that it represents an average useful dose. It should be realized that there is no limit to the amount of antibody that can be given. The only possible source of trouble is the vehicle in which it is held—the foreign serum. Fear of anaphylaxis frequently prevents the administration of a second dose of antiserum and one must admit that the phenomenon in operation is an alarming sight. It is also a fact that it can occur, although infrequently, after a very short dose interval. I am acquainted with an instance of six days. But the chance of trouble can be prevented. If an attack is feared followed half an hour later by a further dose of 20 c cm. In another half-hour the full dose can be given with impunity. As a final precaution some

Practical Notes

Painful Breasts Relieved by Ovarian Residue

Hardgrove reports the case of a woman, aged 29 years, who had had one child and five induced abortions, six years before admission to the Mayo Clinic both Fallopian tubes and one ovary had been removed because of pelvic infection. Except for occasional menorrhagia, the menstrual periods had been normal. The breasts had been painful for sixteen months, the pain usually beginning twelve days before and continuing until the fourth day of the flow. Biopsy of tissue from the right breast showed chronic mastitis. Diathermy, ointments, local injections of novocain, and many forms of ovarian extract, including theelin, failed to give relief. Ovarian residue, recommended by Max Cutler, given in five gram tablets three times a day removed the pain. Proliferation of the corpus luteum coincides with the pre-menstrual period and is accompanied by epithelial desquamation in the mamma. The whole gland and corpus luteum accentuates this response, whereas ovarian residue, made from fresh ovaries of cows or pigs, in which the corpora lutea have been destroyed, checks the action of corpus luteum and relieves pain—(*Proceedings of Staff Meetings of The Mayo Clinic*, July 1, 1931, vi, 289)

Acute Appendicitis in Old Age.

J Lewin points out that this is by no means rare, and that it shares in the altered reaction of the tissues concomitant with old age. There is a much longer history than in early life, for it is not uncommon for seven or eight days to elapse before the symptoms become acute enough to force the patient to seek surgical advice; pain, constitutional disturbance and fever are less prominent, and the symptoms generally suggest acute or subacute intestinal obstruction rather than an acute inflammatory lesion. There is vomiting lasting seven or eight days with the passage of flatus, vomiting is not constant, and not uncommonly pain and tenderness are most prominent on the left side. Operation shows a striking absence of adhesions to surrounding structures and the omentum, pus is often scanty and extremely greasy, forming a thin film over the whole pelvic contents. The operative prognosis is on the whole quite good, considering the age of the patient and the poor reaction—(*British Journal of Surgery*, Bristol, 1931, xix, 63)

The Treatment of Phlyctenular Ulcers.

M Cremer has treated a series of 75 children with phlyctenular conjunctivitis and keratitis by oral administration of calcium in addition to local treatment with the usual mercurial preparations. A control series was observed and it was found that the ulcers healed much more quickly in those who were given calcium than in those who were not. Recurrence of the ulceration occurred in 14 per cent. of cases treated without calcium and in only 8 per cent. of those who had had calcium. The calcium was given by mouth in the form of calcium gluconate, one heaped teaspoonful three times daily—(*Münchener Medizinische Wochenschrift*, July 17, 1931, 3)

oxaligenic As regards the latter there has been some difference of opinion, but the authors are quite definitely of opinion that fats, pure protein and gelatine do not give rise to oxalic acid, and that "oxalic is not a younger brother of uric acid" Sugars are the source from which oxalates arise in the body, and very probably all sugar-containing foods are capable of giving rise to the formation of oxalic acid, glycogen is also a source of oxalic acid, and when the activities of the tissues are impaired oxalic acid, instead of lactic acid, may result from its metabolism, oxalæmia is epigrammatically described as "oxalic and carbohydrate gout" Intestinal fermentation, especially in the presence of tapeworms, which contain much glycogen, may also lead to the formation of oxalic acid These observations have an obviously important bearing on the treatment of patients with oxalæmia and oxaluria, not only should foods containing oxalates be avoided, but sugar and articles of diet which are not pure protein, such as meat, should be restricted, and for this reason fish is preferable As the liver is almost always functionally inactive, it should be stimulated, the alimentary canal should be freed from animal parasites, and metabolism speeded up by respiratory exercises, ultra-violet rays and oxidizing remedies From clinical observations insulin appears to be the most effective drug in the treatment of oxalæmia —(*Presse médicale*, 1931, July 1, 961)

Agranulocytosis and Hypogranulocytosis

Connor, Margolis, Berkeland, and Sharp use the word agranulocytosis for the complete or almost complete absence of the granular leucocytes, accompanied by leucopenia and relative increase, though in most cases absolute decrease in the number of lymphocytes, the word hypogranulocytosis, first suggested by Weiss, describes a less marked reduction of the granular leucocytes with leucopenia and relative lymphocytosis They report 14 cases, 7 of which were agranulocytic angina with 5 deaths, 3 doubtful cases of agranulocytic angina with 1 death, and 4 cases of agranulocytosis or hypogranulocytosis associated with infection elsewhere than in the throat, all fatal Four necropsies showed well-marked aplasia of the bone-marrow, cells of the myeloid series being almost entirely absent, and proliferation of the granular cells nearly at a standstill, necrosis and ulceration in whatever situation showed lack of polymorphonuclear infiltration and any cellular reaction present was lymphocytic and endothelial Agranulocytosis and hypogranulocytosis are regarded as peculiar responses of the bone-marrow and blood to various infections and intoxications, no common etiological factor was found Blood cultures in the five cases examined were negative, and no characteristic results were obtained from throat cultures, though *Fusiformis dentium* and *Borrelia Vincenti* (Vincent's organisms) were the most frequent In all the cases there was evidence of infection to which resistance was slight Recovery is unlikely when the leucocyte count falls below 1,000 In the discussion Heck raised the question of the significance of a raised monocyte count in the blood as a good prognostic sign, and mentioned that the morphological characters of the leucocytes were usually normal —(*Proceedings of Staff Meetings of The Mayo Clinic*, 1931, April 1, vol vi, 193)

Reviews of Books

Recent Advances in Allergy By G W BRAY, M B, with an Introduction by A F HURST, M D, F R C P London J and A Churchill, 1931 Pp 432 Illustrations 94 Coloured plates 1 Price 12s 6d

THE term allergy was first introduced by von Pirquet to indicate a condition of "altered reactivity," but the study of the subject as a whole is a comparatively recent development, and it is now realized that in the term must be included a very large number of states of hypersensitivity, of which the most important are asthma, hay fever, eczema, and migraine. In this volume Dr Bray, a research worker for the Asthma Research Council, has collected into a convenient space almost all the available information on the subject in a way which must be admired by all who read it. He deals first with the phenomenon of allergy in general, beginning with experimental observation and then with the subject clinically, giving data regarding the hereditary, nervous, endocrine, nasal and other factors. In the second part he considers the different manifestations of allergy, and discusses in detail asthma, hay fever, eczema, and hypersensitivity to various substances, and succeeds in showing how very varied are the manifestations of this phenomenon. In each section diagnosis, prognosis and treatment are discussed from practical standpoints and in relation to our present knowledge and researches. He shows us most clearly that of recent years a very large amount of investigation of the subject has been carried out. Dr Bray has had the advantage of being in close contact with the different workers for the Asthma Research Council and has therefore had a somewhat unique opportunity of collecting information, and while giving the views of others he indicates methods which he personally has found useful in dealing with children at the Hospital for Sick Children at Great Ormond Street. Let it be said at once that it is made evident that asthma is a symptom which may be brought about in a variety of ways, and that no specific can be expected, but that if each case be treated with a full understanding of the possibilities, there is an excellent chance of recovery. It is this fact more than any other which Dr Bray brings forward, and in doing so he has earned the gratitude of all who are interested in the subject, for the volume is indeed a valuable contribution to the literature of the subject, not only from the point of view of research, but also of the general practitioner.

A Clinical Study of Addison's Disease By LEONARD G ROWNTREE, M D, and ALBERT M. SNELL, M D Mayo Clinic Monographs Philadelphia and London W B Saunders Co, 1931 Pp 317 Figs 41 Price 18s

THE treatment of this well-known but uncommon disease is notoriously unsatisfactory, and an outstanding point of interest in this complete and valuable monograph is the institution of a new remedy which, although so far employed in nine cases only, is most encouraging. This is the hormone extracted by Swingle and Pfiffner in 1930 from the adrenal cortex injected intravenously. This preparation of a hormone, for which the name Cortin has

been employed, is not yet on the market, but the problem of an active, accurately standardized product that will be acceptable to the Council of Pharmacy and Chemistry of the American Medical Association is being studied. This treatment relieves the acute symptoms of the crisis, removes loss of appetite, induces a feeling of well-being and gain in weight. While believing that a new era in the treatment has dawned, the authors cautiously point out that several years must elapse before its value can be finally settled. It is, like insulin, not a cure, but a method of substitution treatment which must be repeated. It is much more promising than the intensive, so-called Murhead, treatment with adrenalin and adrenal substance, which the authors had previously carried out on 57 patients with benefit in 32. In addition to these therapeutical investigations the authors analyse no less than 108 patients observed at the Mayo Clinic during twenty-two years.

Bedside Interpretation of Laboratory Findings By MICHAEL G WOHL, M D. With an introduction by JOSEPH MCFARLAND, M D, Sc D, Professor of Pathology, University of Pennsylvania. London: Henry Kimpton, 1931. Pp 321. Illustrations 132. Price 25s.

THE author, who, among other appointments, is chief of the first Medical Diagnostic Clinic of the Mount Sinai Hospital, Philadelphia, intends this work to cover the ground between the activities of the clinical pathologist on the one hand and of the general practitioner on the other hand, and to direct the latter in selecting the tests useful for his bedside diagnosis when ordinary physical examination does not justify a certain decision. It is, therefore, not so much a handbook on laboratory technique as a critical estimate of the value of laboratory tests, which sets out their advantages and limitations, and points out which the clinician should carry out himself and which, for example the Wassermann reaction, he would be wise to refer to the laboratory worker. In this generously illustrated volume the blood and the urine are considered at length, whereas the sections on tests for renal and hepatic efficiency are more succinctly summarized. No one test can be regarded as competent to estimate the state of all the functions of the liver, and as that organ has extensive reserve powers, and under certain conditions is capable of very large compensatory hyperplasia, stress is rightly laid on the necessity of correlating the clinical evidence with the results of the various tests for functional efficiency. The skin tests for hypersensitiveness, such as the tuberculin, the Schick and the Dick are discussed with wise discretion.

A Textbook of Laboratory Diagnosis, with Clinical Applications for Practitioners and Students By EDWIN E OSGOOD, M A, M D, and HOWARD D HASKINS, M D. London: J and A Churchill, 1931. Pp xix and 475. Coloured plates 6. Figs 21. Price 21s.

THIS work embodying the teaching of clinical pathology by the Professors of Medicine and Bio-chemistry in the University of Oregon, is divided into two parts, the first contains the knowledge

which the practitioner should have at the bedside with regard to the laboratory methods that he can call to his assistance in arriving at a reliable diagnosis. The second part deals with the knowledge required in the laboratory on the choice, technique, and limitations of the tests to be carried out there. These two parts are therefore admirably adapted for the close correlation of clinical and laboratory work. In the first part, which contains chapters on disorders of the kidneys, metabolism, the central nervous system, the alimentary tract, pregnancy, haematology, the respiratory and cardio-vascular systems, the sections are prefaced by a summary of the normal and pathological conditions, and then the tests which can be profitably utilized are pointed out, the details of their technique being fully set out in the second part. Where all is so good, it is perhaps unwise to select any one subject for special mention, but those on the blood are admirable both as regards the text and the illustrations.

The Nature of Disease By J E R McDONAGH, F.R.C.S. Part III
Section 1 London William Heinemann (Medical Books),
Ltd, 1931 Pp v and 391 Price 21s

ONE cannot help admiring the industry with which Mr McDonagh has set his opinions before the public in three large and beautifully produced volumes, and now promises to issue his further work in journal form, each number of which is to contain a new chapter on the "Nature of Disease". He hopes in course of time "to bridge the gulfs existing between orthodox medicine, homœopathy and osteopathy, and to connect these with the kindred sciences". The main theme pervading his work is that there is only one disease, that the so called "diseases" are but the signs and symptoms of this one disease, and that disease is the result of the defeat of the body's resistance by the invader. This is an interesting thesis, which any thinking practitioner is agreeable to discuss, particularly when it is put forward by the clinician whose able work in organic chemistry has produced such useful therapeutic substances as SUP 36, SUP 468, and contramine. But the difficulty of attempting to understand Mr McDonagh's writings is that he speaks a language of his own, which bears little relation to ordinary scientific terminology, and also that he states, emphatically and dogmatically, as facts what are at most suggestions, conjectures or speculations. For example "Phlegmasia alba dolens, pulmonary thrombosis (post-operative pneumonia) and pulmonary embolism are clinical examples of gelation occurring as a cyclical change of hydration" (p 12) "Osteitis fibrosa is merely an organic lesion resulting from chronic dehydration" (p 60) "Women make more successful spiritualists than men, because their protein particles tend to be more hydrated than those in men" (p 113) "Diabetes mellitus is merely a clinical expression of chronic dehydration" (p 294) "The benefit resulting from removal of part of the thyroid gland in exophthalmic goitre is due to taking away the hydrated protein particles precipitated in the organ, and not to diminishing the amount of thyroid secretion entering the blood-stream" (p 362). The three parts of "The Nature of Disease" already published comprise altogether some 1,180 pages, in which are to be found

many bright ideas and a certain amount of original thought, but they are hopelessly mixed up with a lot of unscientific misstatements

Diagnosis and Treatment of Venereal Diseases By DAVID LEES, DSO, MA, MRCP, FRCS Edinburgh E and S Livingstone, 1931 2nd Ed Pp 634 Price 15s

ALTHOUGH the treatment of venereal diseases in their acute stages has largely been taken out of the hands of private practitioners, a knowledge of their pathology and modern treatment is probably of greater importance than in any other group of diseases. It is to be found in this work. The author's style is easy and the student gains a clear impression of the whole field. In a valuable section on the predisposition of luetics to intercurrent disease, the examination of relatives for signs of congenital infection is advocated. This is particularly useful in children prone to recurrent illnesses, for, as the author says, there is no doubt that with anti-syphilitic treatment the patient is in a much better position to resist such intercurrent disease. The author, however, does not make an exception of tubercle. We have seen many cases apparently activated by anti-syphilitic treatment and believe that patients with signs of both diseases should be treated with bismuth only. The chapter on the central nervous system is excellent reading, but since the work is addressed to students and practitioners, we should like to see it emphasized first, that syphilis is the commonest cause of all the organic nerve lesions which are encountered in actual practice, secondly, that treatment in the early stages is very satisfactory, and finally, that this alone justifies the thorough application of the therapeutic test to all doubtful cases. The reader will find sound information on the newer remedies, but the statements that "914" may be given intramuscularly (p 156) and that it does not give rise to necrosis (p 160) require qualification. The young practitioner who administered the N.A.B. issued by the Ministry of Health by this route would deeply regret the experience. These, however, are trifling criticisms and do not detract from the high qualities of the book as a whole.

The Alcohol Habit and its Treatment By W E MASTERS, M.D. London H K Lewis and Co, 1931 Pp viii and 190 Price 6s

THE author, who is Medical Superintendent of the Hare Nursing Home, Chislehurst, is introduced by Sir William Willcox, who fully agrees with the recommendation that the legal powers for compulsory treatment of alcoholism should be strengthened. Dr Masters was a colleague of the late Dr Francis Hare, who died in 1928, and being a barrister has added a chapter on the legal aspects of this subject. Much benefit is ascribed to treatment by apomorphine, not only of maniacal intoxication, but in eliminating the craving for alcohol and in counteracting insomnia. Dr Hare's treatment by strychnine and atropine injections three times daily for five weeks is described, and the difficulties about prognosis are considered.

Health and Social Evolution, the Halley Stewart Lectures, 1930.

By SIR GEORGE NEWMAN, K C B, M D, Hon D C L, LL D
London George Allen and Unwin, Ltd, 1931. Pp 200
Price 4s 6d

THE Halley Stewart Trust, founded on December 15, 1924, for Research towards the Christian Ideal in all Social Life, has since 1926 provided yearly lectures which have been given by Sir Oliver Lodge, Bishop Gore, Professor Gilbert Murray, and Dr Tawney. In his lectures Sir George Newman discusses and answers the following questions: What has England done for the health of the human body? Why and how did she do it, and what have been the results? Adopting the historical method he shows how England learned to control disease after being warned of the necessity for preventive medicine by the black death which fell upon the country as a thunderbolt and for three centuries bred sickness, misery and social disturbance. During the eighteenth century the ravages of small-pox provide an instructive lesson, and soon after the building of voluntary hospitals in London and the provinces, prison reform, public health and popular health education, showed the influence of a beneficent spirit of humanism for which John Wesley and John Howard worked so long and devotedly. After the widespread influence of Bentham and Owen has been explained, the share that medical men have and are taking in the improvement of the common health is fully acknowledged, and the question of a State medical service is discussed, here it is very definitely laid down that a public medical service should never convert the medical profession into a branch of the civil service. Sir George writes with authority, and not only this, but with the charm of a master of the scholarly style.

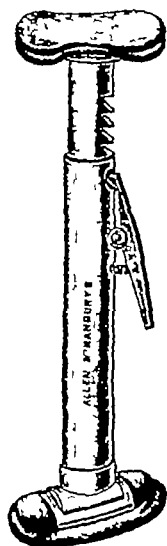
Your Servant the Doctor By "G P" (W B COSENS) London
John Bale, Sons and Danielsson, Ltd, 1931 Pp 192 Price
7s 6d

THIS interesting and attractively written book contains the frank and outspoken opinions of a very loyal general practitioner. He shows how much and how well general practitioners can do their work, points out their woes, and has a few hits at consultants and Harley Street. Panel practice is a godsend to the general practitioner, voluntary hospitals have now ceased to be rightly so called, and though, like Charles II, they may take a long time in dying, they will be at no distant date superseded by State establishments, to talk about co-operation between voluntary and State hospitals is compared to the mixture of oil and water. Birth control he definitely regards as a necessity for the State and the individual, and millionaires, of whom he confesses to have met two, are stated to be specially prone to indigestion and insomnia.

Preparations and Inventions

A JAW SUPPORT

(London Messrs Allen and Hanburys, Ltd, 48, Wigmore Street, W 1)



Dr G A Metcalfe (Bedford) writes —With an artificial airway in position it is often necessary and sufficient to hold the chin up in order to obtain a free air passage while administering an anæsthetic. For this purpose I have devised the simple adjustable prop here illustrated. This fits between the clavicle below and the mandible above, and is pulled out to the length desired, where it automatically fixes itself by means of the ratchet. The ends are grooved and padded to fit the bones, and the upper end is made to rotate so that its groove can come into line with any part of the ramus. It is sometimes necessary to hold the prop in position by means of tape tied round the neck.

AN EMERGENCY AID IN BURNS

(London The Crookes Laboratories, Gorst Road, Park Royal, N W 10)

The theory underlying the tannic acid treatment of burns is that the toxæmia occurring from the absorbed products is prevented by rendering the latter insoluble. A coagulum occurs on the surface of the wound due to the precipitation of the proteins and this appears to prevent the absorption of the toxic substances. The actual method employed is the application of a 2.5 per cent solution of tannic acid in warm sterile water sprayed on the affected parts, and dried by means of electric lamps in a bed cage. This process is repeated hourly until the whole area is covered with a thick brown coagulum. The coagulum can usually be peeled off after some days and it will be found that underneath complete healing has occurred. An important factor in connection with the tannic acid method of treatment is the instantaneous alleviation of pain after the first application, and the consequent minimising of shock. The treatment has hitherto suffered from the almost insuperable disadvantage that solutions must be freshly prepared, the use of stale solution is strongly contra-indicated. In order to overcome this difficulty, and to ensure that this valuable aid in an emergency may always be immediately available, the Crookes laboratories have devised and are issuing a special stable solution in ampoules and a spray adaptor for its application.

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The Etiology of Chronic Rheumatic Disease

By SIR WILLIAM WILLCOX, K C I E, C B, C M G, M D,
F R C P

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Medical School, Medical Adviser to the Home Office*

THE importance of an accurate and up-to-date etiology of chronic rheumatic disease cannot be over-estimated, since a knowledge of the causation of this disease forms the basis of rational and successful treatment. An article by me on the etiology of chronic rheumatism appeared in *THE PRACTITIONER* in March, 1930¹. Since that time activity in research on this subject has been maintained all over the world, and important advances in knowledge have been achieved.

Chronic rheumatic disease still holds the foremost place as being the disease which in one or other of its many manifestations presents itself most frequently of all ailments to the medical practitioner who is consulted for advice and treatment. The statistical evidence given in the paper of March, 1930, still holds good, and there is no evidence of a falling off in the incidence of the disease amongst all classes of the population. It was there pointed out that the Ministry of Health Report of 1924 showed, from the statistics for insured persons for 1922, that in males the total length of sick absence from work caused by rheumatic disease (mainly chronic rheumatism) was one-sixth and for females one-seventh of the total sick absence

due to all diseases. These figures give cogent proof of the frequency of occurrence of chronic rheumatism and of the great importance to the medical practitioner of an accurate knowledge of its causation and treatment. It is fitting, therefore, that a review of the etiological aspect should again appear.

Research in the subject has been actively prosecuted in Europe. The International Society of Medical Hydrology has done great service in linking up the different lines of investigation which are taking place in this country and on the Continent. International committees have been formed and these have done much in organizing research on an international basis. In Great Britain active research work has been carried out in our hospitals and by independent investigators. In London the institution by the British Red Cross Society of a Central Clinic for Rheumatism, organized on similar lines to the voluntary teaching hospitals, has provided valuable facilities for research. The Order of the Hospital of St. John and Jerusalem has undertaken the organization of a London Light and Electrical Clinic, on similar lines, under the supervision of Sir Leonard Hill, where special attention is paid to research in chronic rheumatism and the value of various forms of radiation in its treatment. In America some most valuable researches have been effected, which have far-reaching importance on the part played by infection in the causation of chronic rheumatic disease.

The etiology of chronic rheumatic disease is a very complex subject, and the factors which play a part are many and diverse. There is such great variation in the etiology of each individual case that no two cases are exactly alike as regards the qualitative and quantitative part played by the several factors comprising the individual causation. General etiological factors which were dealt with in my article in this journal in March, 1930, are as follows:—

(1) *Traumatic strain*, which plays a part in the

causation of such conditions as lumbago, fibrositis of the back and neck, and inflammation of tendon insertions such as tennis elbow.

(2) *Occupation*, where the strain imposed on certain groups of muscles or joints, and the fatigue of prolonged exertion determine the localization of the rheumatic disease.

(3) *Constitution or diathesis*, where there is an inherited tendency in some families and races for the development of chronic rheumatism when exposure to a group of etiological factors exist

(4) *Skin conditions* On the Continent special attention has been paid to the part played by the skin in the causation of chronic rheumatism. It has been shown by means of special thermometers that the skin temperature in rheumatic patients is often lower by 3 or 4 degrees than that of a normal person. In such subjects the reaction of the skin to varying conditions of atmospheric moisture and temperature is markedly deficient

(5) *External influences*, such as climate, exposure to damp, cold, and chilling draughts of air, are important. In tropical countries such as India, where the climate is hot and dry, chronic rheumatism is almost unknown

(6) *Circulatory defects*. Conditions where the vasomotor control of the blood-vessels is defective cause a predisposition to chronic rheumatic manifestations. The common occurrence of arthritis in the phalangeal joints in Raynaud's disease is an example of this. Similarly, defective lymphatic circulation and resulting lymph stasis are common causes of the development of fibrositis and local rheumatic manifestation. Heat and massage are obviously indicated in such conditions. Too little attention has been paid in this country to the etiological importance of circulatory defects

(7) *Diet* is important. There should be no defect in the allowance of protein and fat, and excess of carbohydrates is to be avoided. The diet should be

rich in necessary vitamins, since their insufficiency or absence has been shown to be an important predisposing cause.

(8) *Endocrine disorders* undoubtedly play a causative part in some cases, especially in those forms of chronic rheumatism associated with the climacteric, where defective thyroid and ovarian secretion are likely to occur

(9) *Acute rheumatism* is a distinct disease from the chronic rheumatism under consideration, but in my experience a person who has been subject to acute rheumatism in early life is predisposed to develop in later life some of the manifestations of the chronic form such as chronic arthritis of a rheumatoid type

(10) *Sex* Both sexes are liable to chronic rheumatism, the variation in frequency of particular manifestations in the different sexes can be largely accounted for by variations in the exposure to strain and external influences. A study of the Ministry of Health Report quoted above is illuminating in this respect.

(11) *Age* Chronic rheumatism is almost unknown before puberty, afterwards it may affect any age and, as age advances, the predisposition increases.

(12) *Gout* is a disease distinct from chronic rheumatism. Persons who are subject to gout are predisposed to develop chronic rheumatic arthritis. A very interesting radiological research has been recently carried out by Dr. S. Gilbert Scott at the British Red Cross Society's Central Clinic for Rheumatism. He has shown that, in the cases of the gouty type, deposits occur at the sides of the phalangeal bones. Symptoms of acute gout do not usually appear to occur in these cases, and the uric acid in the blood is not raised. The presence of slight deposits in the phalangeal bones in a case which is clinically a chronic rheumatic arthritis does not call for the administration of drugs, such as atophan and its derivatives, which carry a distinct risk of the

development of toxic jaundice. The treatment of these cases should be on the same lines as for chronic arthritis unless the blood tests show a marked rise of uric acid. It would be advantageous if analytical investigations were carried out in order to determine whether the deposits found under the periosteum of the phalangeal bones were in fact composed of sodium bi-urate.

INFECTIVE CAUSES

As a result of an intensive study during the past twelve years of a very large number of cases of chronic rheumatic arthritis and other forms of chronic rheumatism in the wards of St Mary's Hospital, I have become completely convinced that by far the most important etiological factor is an infection with a streptococcal organism; this may be the viridans or the hæmolytic type and less frequently the indifferent type. In this research I have had the great advantage of the unsparing co-operation of my colleagues in the bacteriological and pathological departments of the Institute of Pathology at St Mary's Hospital. In almost all cases of chronic rheumatic arthritis and other forms of chronic rheumatism a streptococcus infection, usually of the blood reacting type (hæmolytic or viridans) has been found in the foci of infection (naso-pharynx, teeth, bowel).

In my previous articles in *THE PRACTITIONER* on this subject I have dealt fully with the important part played by septic foci containing streptococcal organisms in the causation of rheumatic arthritis and other forms of chronic rheumatism. Emphasis has been laid on the importance of investigation as to the possibility of an infected condition (focus of infection) in the teeth, tonsils, antra, naso-pharynx, pharynx, intestinal diverticulitis and colitis, gall-bladder, appendix, and urogenital tract. In the clinical investigations for foci of infection I have had the

advantage of the close co-operation and valuable help and advice of my colleagues in the dental, throat and other departments. Radiological investigation of the teeth and nasal sinuses have been carried out in all cases, and where indicated the gall-bladder, gastro-intestinal tract and urogenital tracts have been submitted to similar investigations. Dr. Harrison Orton and his colleagues in the X-ray Department of St Mary's Hospital have been unremitting in their valuable co-operation.

As a result of investigation on these lines, in almost every case definite evidence of a streptococcal infection from a focus of infection in an infected organ has been found, and this has been a valuable indication in the line of treatment to be adopted in each individual case. The weak point in the above work has been that we have not succeeded in obtaining the suspected causative streptococcal organism from the blood and joints in the cases investigated.

This defect of complete proof has now been overcome as a result of valuable research work in America. In 1929 an article entitled "The bacteriology of the blood and joints in chronic infectious arthritis" was published by Russell L. Cecil, Edith E. Nicholls and Wendell J. Stainsby.² In this research 78 cases of chronic infectious arthritis were submitted to blood culture. In 48 of these (61.5 per cent) a streptococcus was found, in 40 of these 48 an attenuated *Streptococcus hæmolyticus* was found, in 6 a *Streptococcus viridans*, and in 2 a streptococcus of indifferent type. The technique of the investigations was of a special type. Large quantities of blood, 20 to 30 ccm were taken, and these were incubated for long periods. The average time of appearance of the streptococci in the cultures of the blood was fifteen days, the organism being very slow in its primary growth. The necessity for taking a large quantity of blood, and for waiting an unusually long period for growth to

occur in primary culture explains the lack of success of previous investigators to achieve similar results. The organisms isolated from the blood showed a positive agglutination test (1 in 280) with the serum of the patient. The isolated organisms were sub-cultured, and intravenous injections of these subcultures produced typical arthritis in animals.

Joint cultures—In seven cases of chronic infectious arthritis, *intra vitam* cultures were taken from the joints. In six, synovial membrane or bony curettings were available and, in the seventh, synovial fluid was taken from the knee-joint. In five of these cases, positive joint cultures were obtained. Four of these cases yielded streptococci, two being an attenuated hæmolytic streptococci, one a *Streptococcus viridans* and one a streptococcus of indifferent type; the fifth case gave a pure culture or a diphtheroid bacillus.

The above research appears to be of far-reaching importance and places on a sure foundation by adequate experimental proof the truth that chronic arthritis is primarily caused by a streptococcal infection, carried to the joints by the blood stream.

A further valuable article by the same authors appeared in January, 1931,³ entitled "The etiology of rheumatoid arthritis" [The technique adopted was similar to that in the previous research. The results arrived at were as follows. Streptococci were recovered from the blood by blood culture in 62·3 per cent of 154 cases. Streptococci were recovered from the joints in 67·3 per cent of these cases. High agglutination with the streptococci isolated occurred in 94 per cent of cases. Streptococci of similar type were found in all the foci of infection. Animal experiments showed that arthritis of rheumatoid type was produced by injection of cultures of the streptococci into rabbits. This research furnished overwhelming experimental proof of the infective nature of rheumatoid

arthritis.

For the past few years I have felt convinced that the primary etiological factor in the causation of rheumatoid arthritis was a streptococcal infection, and the American work fully confirms this view. There has been a tendency in this country to regard rheumatoid arthritis as being non-infective in origin. This view of the etiology of rheumatoid arthritis is not now tenable. The various types of chronic rheumatic arthritis have always appeared to me to so closely merge into one another that I have been accustomed to use the simple term "Chronic arthritis" for all of them. It appears that a streptococcal infection is the basic etiological factor in all.

In this journal, in August, 1927,⁴ it was stated by me. "The claim for the infective origin of chronic rheumatism is exceedingly strong and must be admitted"; again in March, 1930,¹ I stated. "Chronic rheumatism is not a disease *per se* but is the inflammatory reaction in the joints or fibrous tissues following on some pathological condition usually a chronic toxæmia."

In conclusion, while one must regard as of importance the general etiological factors quoted above (1 in 12), these should be looked upon as predisposing causes. The primary and most important basic cause of chronic rheumatic disease is a streptococcal infection.

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² Cecil, Russell J., Nicholls, Edith E., and Stainsby, Wendell J. "The Bacteriology of the Blood and Joints in Chronic Infectious Arthritis" *Arch Int Med*, 1929, xlii, 571

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Modern Methods in the Treatment of Chronic Rheumatism

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IN dealing with the treatment of chronic rheumatism, several affections which, although apparently connected and sometimes changing into each other, yet differing considerably in cause, site, course, and prognosis, must be considered. It is customary to divide the group into articular and non-articular manifestations; the articular sub-group includes the following conditions. (1) rheumatoid arthritis, (2) focal or infective arthritis, (3) osteo-arthritis, (4) gout; (5) unclassified joint changes, (6) Still's disease (children) Included in the non-articular group are: (7) muscular fibrositis, (8) neuro-fibrositis

It is usual to regard as "non-rheumatic" certain arthritides associated with the gonococcus, the tubercle bacillus, the pneumococcus, the meningococcus and the *Treponema pallidum*. On the other hand, certain conditions due to the presence of a septic focus of undetermined nature are retained within the rheumatic group.

RHEUMATOID ARTHRITIS

It will be noticed that rheumatoid arthritis and infective arthritis are mentioned separately. While the changes in both conditions are periartritic in nature, the resemblance ceases there. If that much-abused term, "rheumatoid arthritis," could be confined to a definite type of case, the gain in lucidity of description would be considerable. From this point of

view, "rheumatoid arthritis" should be restricted to a progressive, wasting disease, mainly affecting women during the child-bearing periods of life. After an initial attack of pyrexia, often preceded, as Llewellyn¹ long ago pointed out, by certain premonitory symptoms not necessarily arthritic, but vasomotor, motor or sensory, the smaller joints of the hands are affected symmetrically. It is characterized by atrophy of the skin, as shown by its glossy appearance, absence of wrinkles and tightness over the joints. There is wasting of the muscles beginning in the dorsal interossei. Some waste more than others, causing gross deformities. The joints become disorganized, and bony ankylosis may follow. Osteoporosis or atrophy of the bone cells is seen on X-ray examination. As the condition progresses, other and larger joints are in turn implicated. The key to the diagnosis is the recognition of the symmetrical and centripetal march of the joint affections.

The etiology of this condition being mainly speculative, its treatment is largely expectant. Its association with a demonstrable focus of infection is not common, but that should not preclude a careful search for and, if found, its removal. There is usually evidence of a profound metabolic upset. Achlorydria and hypochlorydria are common. Hurst² has pointed out that in oral and pharyngeal septic states, organisms may invade the mucous surfaces, and in some way or another give rise to toxins which may produce pernicious anæmia and subacute combined degeneration of the cord. This has an important bearing on the possibility of a neuropathic origin of rheumatoid arthritis. Pemberton and others have shown that there is a delay in the removal of sugar from the circulating blood.

The general treatment follows the usual hygienic measures adopted in chronic wasting diseases. If the patient can afford it, residence in a dry and sunny climate often helps. High, dry altitudes in the early

stages will often promote a more efficient oxygenation of the tissues. In the absence of any precise knowledge as to the existence of a causal organism, vaccine treatment can only be empirical and is often disappointing. Probably just as good, if not better, results have been obtained by non-specific protein therapy.

Drug treatment is mainly confined to the exhibition of tonics, and to dealing with any underlying metabolic errors, as, for example, the use of dilute hydrochloric acid in cases of hypochlorydria. The diet should be rich and stimulating. As in most instances, sugar tolerance is lowered, a high carbohydrate diet controlled by insulin is advocated as a means of improving the bodily condition generally. It has been found by Howitt at the British Red Cross Society's Clinic that arthritic patients under this treatment put on flesh rapidly.

Local treatment should be directed towards the improvement of the circulation in and around the joints, the prevention of deformities by the timely application of splints which should include a "cock-up" for the hand and wrist, the maintenance of joint function by manipulation with active and passive movements when the inflammation has subsided. One cannot help thinking that the aid of the orthopædic surgeon is not invoked as often as it might be. For the relief of pain, hot douches either applied directly or under water, hot packs of mud or paraffin wax, radiant heat or diathermy, will all be found efficacious.

INFECTIVE OR "FOCAL" ARTHRITIS

The history of infective arthritis is often written from the symptoms of rheumatoid arthritis. A distinction should therefore be drawn between the two diseases. Many accounts of the successful treatment of rheumatoid arthritis and the successful results following the removal of infective foci are based on a confused diagnosis. Taking some of the chief points of difference. Both sexes are equally liable, and the joint and

bony changes although similar are less regular in their distribution. Larger joints may be involved from the first. The fingers may be and often are implicated, but the symmetrical march of events is lacking. The premonitory assemblage of symptoms which is so characteristic of rheumatoid arthritis is also missing.

In treatment the first and logical indication is the search for and removal of the focus of infection, in which the aid of the surgeon, the gynæcologist, the laryngologist and the dentist may have to be invoked. If this is successful the cure is often straightway inaugurated. No treatment, medicinal, vaccine or physical, should be considered so long as a possible focus of infection remains undiscovered and untreated. If a vaccine is to be employed, it should be directly after the causative focus has been dealt with, in order to nullify the possible ill-effects of any toxins that are lodged in the tissues or circulating in the body fluids. Opinion is sharply divided as to its value, since no organism has yet been discovered in association with chronic arthritis that fulfils even one of the four postulates of Koch. Although with the disappearance of the causal factor, the *vis medicatrix naturæ* asserts itself, the evil effects of the inflammation of the joints and their consequent immobilization will require physical treatment for the resolution of periarticular adhesions, the restoration of joint movements and the relief of pain.

OSTEO-ARTHRITIS

Speaking generally, osteo-arthritis is more liable to affect joints that are subject to strain or weight-bearing. It is usually regarded as a degenerative condition, and its subjects are generally older than is the case with the two foregoing. Larger joints are involved, sometimes only one. The knees, hips, and spine are perhaps the commonest. It is as a rule

afebrile, with a gradual onset and characterized with the formation of osteophytes accompanied by grating, lipping and eburnation. The patients are generally well nourished and frequently of a florid type.

There is often a history of a strain or injury to the affected joint, which may have taken place some years previously. Its relation to a focal infection is not well defined. Glover³ points out that 75 per cent. of the population over forty have septic mouths, yet many of them remain free from arthritis. Auto-toxæmia undoubtedly plays an important rôle in the etiology of this condition. In this connection, it is of interest to recall the fact that the central portion of the articular cartilage obtains its nourishment from the synovial fluid direct. If the joint fluids, in common with other bodily fluids, are charged with the products of faulty metabolism, the ease with which the cartilage, possibly damaged by some antecedent strain, may be implicated is obvious.

General treatment should therefore be directed towards the relief of any faulty metabolic process that may be present. Perhaps the most outstanding indication is to reduce the caloric value of the diet to more reasonable limits. Careful regulation of the diet on these lines is especially required during a course of physical treatment at a spa or elsewhere in order to spare the patient unnecessary metabolic burdens. In all cases an adequate supply of vitamins should be ensured as many authorities consider that this form of arthritis is associated with the absorption of toxins from a sluggishly-acting bowel. Probably one of the best intestinal disinfectants for routine use is the combination of guaiacum and sulphur in the form of a cachet or tablet. With a similar object, colonic lavage has its advocates, and if employed judiciously, is capable of giving good results. Physical treatment, presently to be considered, is chiefly concerned with the maintenance of the function of the joints and the

relief of pain

GOUT

Acute gout hardly concerns us here. Chronic multiple gouty arthritis is numbered among the rheumatic disabilities on account of its clinical similarity to other forms of arthritis. The routine X-ray examination of a large number of arthritic cases at the British Red Cross Society's Clinic has revealed unsuspected gouty changes in quite a large proportion. Treatment is, of course, general and local. The former follows the usual lines of the dietetic restrictions of purins and the administration of colchicum, which by the way is one of the few drugs that has any specific action in arthritis. Where practicable, a periodic visit to a spa greatly benefits the gouty individual. In the recourse to physical measures for local as well as general treatment, care has to be taken with regard to their selection on account of the risk of precipitating an acute attack.

UNCLASSIFIED JOINT CHANGES

One of the chief difficulties attending the precise diagnosis of a case of arthritis is the frequency with which arthritic changes appertaining to different conditions are found in the same individual. The present confused state of the nomenclature makes it undesirable to introduce new categories, at any rate until etiological and other factors concerned in the rheumatic state have been more fully worked out. It is for this reason that arthritic disability which affects women at or near the menopause is mentioned under this heading. It is characterized by changes in the finger joints as well as in one or more of the larger articulations, more often the knees. It is associated with changes in the endocrine system and often dependant on static irregularities following an increase in the bodily weight. Treatment consists in attention to the underlying endocrine imbalance, the reduction of

weight, the correction of deformities, and dealing with the inflammation of the joints by the various physical measures to be described.

STILL'S DISEASE

Periarthritis in children, beginning insidiously between the ages of 3 and 7, has to be distinguished from acute or subacute rheumatism with cardiac involvement and those somewhat rare cases of late or recurrent rickets. The articular changes in acute rheumatism are unaccompanied by much muscular wasting and usually clear up, leaving the cardiac disability. In Still's disease, the heart is generally not affected, but along with the slowly-progressing arthritis, there is marked muscular wasting with serious limitation of movement at the joints. The spleen and lymphatic glands are enlarged and some pyrexia is present.

Treatment consists of general measures directed towards combatting the extreme debility and the adoption of mild physical measures, such as the warm pool bath with underwater douche to aid movement and packs to relieve pain

MUSCULAR FIBROSITIS AND NEURO-FIBROSITIS

The white fibrous tissue which sends its prolongations to form the supporting structure of the body as well as the coverings of the muscular bundles, their tendinous attachments and the sheaths of the nerve fibres must of necessity be intimately concerned with the biological interchange of fluids that is continually taking place as the result of bodily activity. If by reason of faulty metabolism, cold or dampness from climatic or other circumstances, the products of these activities are retained, the supporting structures carrying the blood-vessels, lymphatics and nerves are bound to be affected. The result is often a blocking of the lymphatics, and the tissue reaction shows itself by the presence of hard nodules and inflammatory fibrous bands. The mind

is only aware of muscular action when there is any obstacle to its smooth response to nerve stimulation. The obstacle is furnished by the nodules and inflammatory thickenings which produce the condition known as muscular fibrositis. When these nodules and thickenings are in relation to a nerve fibre and set up a neuritis or a neuralgia the condition is neuro-fibrositis.

The general treatment comprises attention to the underlying metabolic error and the avoidance, if possible, of its cause. Many of these cases are undoubtedly due to a focus of infection which has to be looked for and dealt with. No treatment is of any avail until this question has been satisfactorily settled. As the majority of the patients have inactive skins and rarely perspire, measures to promote sweating are clearly indicated. Local treatment should at first be confined to keeping the parts at rest, by splints if necessary, and allaying inflammation by sedative methods. Massage at this stage usually causes too much pain and is better avoided. Later on much can be done to afford relief by massage and the various forms of physical treatment described below.

PHYSICAL TREATMENT

Inefficiency of the skin as an adaptative organ is one of the outstanding features of the rheumatic syndrome. By this vast area of cutaneous sensory nerve endings in close association with the thyroid-adrenal-sympathetic system, the reactions of the body to external influences such as temperature, light and humidity, are determined. The capillaries of the skin form a huge vascular reservoir capable of containing one-third of the entire blood supply of the body. States of relaxation or contraction of these vessels have therefore a profound effect on deeper structures. This "buffer-action" of a highly-sensitive organ renders it particularly suitable for the application of the energy of heat, light, movement and electricity as

therapeutic agents.

The manner of their employment constitutes that branch of the medical art commonly known as "physical treatment" Heat and cold may be applied generally or locally in immersion baths of plain or mineralized water, packs of various kinds or in hot air and vapour rooms. The energy of movement finds its use in manipulations and exercises, frictions, percussion by douches and the action of whirling water Radiation is employed as heat, light and invisible rays (ultra-violet and infra-red) from arc, mercury vapour or other lamps. Electricity is applied as constant current to resolve exudations and promote nutrition; as interrupted current to cause movement in muscle fibres, and as high-frequency current (diathermy) to raise the temperature of deep-seated parts through their resistance to its passage

Physical remedies may be sedative or stimulating, according to the method in which they are used For example, subacute cases require sedative treatment for the relief of pain, to diminish congestion, and to allay circulatory and nervous excitement For such purposes, warm applications of water and gentle manipulations are required. Chronic cases need brief and intensive application of heat with strong manipulation Being stimulant measures, they cause active hyperæmia and increase the circulation of the blood and lymph and help to remove the effects of former disease or injury.

The failure in the adaptable functions of the skin, briefly referred to above, include inactivity, a deficient sweat secretion, and a sluggish circulation Besides remedying these defects, treatment should be directed towards stimulating the defensive mechanism of the body, the restoration of movement in stiffened joints and muscles, the resolution of old inflammatory adhesions and the relief of pain

Taking them in the above order, we shall now con-

sider the best methods of meeting these various indications :—

(1) *Inactivity of the skin with deficient sweat secretion.*

—Immersion in reclining baths at a temperature above that of the body will raise its internal heat, due to the prevention of heat loss from the surface. In this manner sweat secretion is stimulated. The same applies to a vapour bath. A hot-air bath will promote perspiration without raising the internal temperature. Brine, peat and mud baths also induce free perspiration. Alternate hot and cold douches have the effect of toning up the skin and increasing its activity

(2) *Sluggish skin circulation.*—The manipulative douche is largely used to combat this. It consists essentially of massage under constantly flowing streams of hot water. During the course of this treatment, the fingers and hands of the operator gliding smoothly over the softened parts, grasp and squeeze the tissues, thus emptying the lymphatics and stimulating the flow of blood in the capillaries. The “Scotch” or alternating hot and cold douche, without massage, is also used. By its action the blood vessels are alternately relaxed and contracted, which helps to restore their tonicity. It is employed extensively in the treatment of muscular rheumatism and old-standing sciaticas

(3) *Stimulation of the defensive mechanisms of the body.*—Stated briefly, the action of a vaccine or other protein is to stimulate the defensive mechanisms of the body. In the course of treatment by hot baths and manipulation, certain substances lying in the neighbourhood of the affected parts may be taken into the blood stream and there act as a “foreign” protein. Protein derived in this manner may produce a “shock” reaction precisely similar to that obtained by the hypodermic injection of a vaccine or some non-specific protein. This phenomenon is very familiar to spa practitioners and is usually known as a “bath” reaction. It is usually followed by considerable

improvement in the condition for which the treatment was prescribed.

(4) *Restoration of movement in stiffened joints and muscles*—The "pool bath" is extensively used for this. The temperature varies from 97 to 104° F. At the lower temperature it is sedative and suited for subacute cases. At the higher, it is stimulating and more adapted to chronic cases. It is of sufficient size to allow the patient to stand, sit, and walk a step or two. Combined with the pool is an underwater douche at a temperature of 10° above the bath. This has a powerful effect on the skin circulation and in itself constitutes a very efficient form of massage. A limb immersed in water weighs less and moves with less fatigue than under ordinary circumstances. The limbs are supported and movements that would be otherwise impossible can be performed. The importance of getting a patient to move his stiffened joints at the earliest possible moment after the inflammatory condition has passed off cannot be too strongly emphasized. No joint can possibly attain a healthy state unless it exercises its proper function of movement. Movement of the limbs in water is something between active and passive motion. Volitional motions are made and carried through with a much less expenditure of energy. The too frequent immobilization of joints for extended periods is responsible for much permanent stiffness and consequent invalidity. Along with the passive or active movement of the joint, the muscles that control it must receive attention by massage and, if necessary, the application of the Faradic current.

(5) *Resolution of old inflammatory adhesions.*—The inflammatory exudation following an attack of arthritis or fibrositis often becomes organized into painful bands which cripple and limit the movements of the joint and give rise to painful hard nodules and tender patches in the muscles. The presence of indurated swellings and blocked lymphatics in the neck may cause brachial

neuritis and even deformity of the fingers. Skilful massage of these regions can frequently relieve not only the pain, but markedly diminish the deformity of the fingers. Treatment on these lines has been successfully applied to the stiffened hands in early rheumatoid arthritis. Counter-irritation in the form of blisters along each side of the cervical and dorsal spine may usefully be combined with the manipulations. If along with the massage, wherever applied, hot and cold alternating douches and radiant heat are employed, the benefits will be further enhanced. Some of the most intractable forms of sciatica are due to the presence of hard inflammatory indurations along the course of the nerve. If treatment by these methods is persevered with, a considerable amount of relief will ensue.

(6) *The relief of pain.*—Heat is a sovereign remedy in the relief of pain. It should be intensive or as hot as can be borne. Everyone knows the efficacy of a hot poultice. There are many ways in which heat can be applied. Among them are the hot immersion bath, general or local, plain or mineralized, hot douches, hot packs of mud, peat or paraffin wax, local vapour or heated air. The temperature of deep-seated parts can be effectually raised by means of the high-frequency current (diathermy).

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Sciatica

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IN a symposium in THE PRACTITIONER concerned with rheumatic affections it is desirable as far as this is possible to limit a description of sciatic pain to that type to which the term "rheumatic" can more or less justifiably be applied. To do so, however, it will be necessary to touch upon the various classifications of sciatica and to examine briefly the different theories which have been advanced to account for sciatic pain when insufficient data are forthcoming to make the diagnosis clear. Nomenclature would appear to be somewhat chaotic, and while many observers group cases of sciatica as primary, idiopathic or essential, and as secondary or symptomatic, Sicard bases his classification on anatomical lines and calls them high, middle and low sciaticas, the high sciatica having its origin at a lesion between the posterior-root ganglia and the origin of the nerve plexus, the middle and low varieties being produced by lesions in the nerve plexus or nerve trunk. Putti, on the other hand, ascribes primary sciatica to pathological states about the intervertebral foramina and articulations.

It would seem therefore that if we are to retain the classification of primary and secondary sciatica it is only reasonable to include as secondary sciatica those cases defined by Putti as due to lesions about the intervertebral foramina, and to include as primary only those cases which present the syndrome, either of neuralgia without disturbance of reflexes or true neuritis with loss of ankle jerk, in the absence of evidence of the causative factor. In other words, "sciatica" should not be used as a diagnosis unless qualified. Thus idiopathic or primary sciatica would be on a par with Banti's disease, and this diagnosis

made only when there is insufficient evidence to establish the cause. Other sciaticas would be grouped with the provocative disease, for example, "diabetes with a sciatic neuritis" and "arthritis of the lumbar vertebræ with sciatic pain". In regard to this last it is indeed not improbable that many cases of so-called idiopathic sciatica *are* due to arthritis of the lumbar vertebræ, though in the early stage X-rays will show no abnormality, seeing that not infrequently cases giving a past history of sciatica some years prior to examination for other disabilities show changes about the vertebræ in question, and some cases of so-called idiopathic sciatica with no abnormal findings at the initial examination, when re-examined by X-rays at a later date give quite conclusive evidence. Any rigidity of the lumbar vertebræ therefore should be regarded with suspicion.

Very little need be said about the secondary sciaticas since these are due to disease initially outside the course of the sciatic nerve and can be classified at will according to the personal inclination of the observer, when the particular lesion evoking sciatica has been investigated by a careful clinical examination of the vertebral column, hip joint, abdomen, pelvis, and nervous system, aided when occasion demands it by radiology and biochemistry. Moreover, any departure from the symptoms and signs usually associated with the diagnosis of idiopathic sciatica, either in abnormal distribution of pain, unusual reflex actions, pronounced muscular wasting, well-marked reaction of degeneration associated with but slight muscular wasting, or lack of mobility of the vertebræ should call for an especially meticulous examination. In passing it should be noted that whatever the cause, established or unestablished, of sciatic pain, a clear distinction should be made between sciatic neuralgia with its entirely subjective symptoms and sciatic neuritis with its objective physical signs such as disturbed ankle

jerk, though not infrequently the former merges into the latter.

Turning now to *rheumatic sciatica*: there is very little evidence to make a dogmatic statement to the effect that there is such an entity, though cases are recorded in which a perineuritis of the nerve trunk has been exposed by operation and such terms as perineuritic fibrositis applied. Llewellyn states that "many cases of sciatica are secondary to a gluteal, lumbar or sacral fibrositis, and the morbid process frequently gives rise to diffuse or localized infiltration in these structures." He refers to the work of Craigie, who thought that the superficial and aponeurotic coverings of the glutei and tensor fasciæ femoris were attacked primarily and that subsequently the morbid process encroached upon the sheath of the sciatic trunk. According to this theory the *fibrous tissue resulting from an initial inflammatory state* involves the sheath and interstitial tissues of the nerve trunk, the prolongations of scar tissue extending to the sciatic notch in particular. Llewellyn goes on to state that "of a series of forty-seven cases operated on by A. Pers fibrous bands were in thirty instances found in the neighbourhood of the foramina, of the remainder, adhesions were found in thirteen, not only in the sciatic notch, but in the thigh, and in three in the thigh only," and "in thirty-two instances whose symptoms were suggestive of adhesions Crawford Renton exposed the nerve trunk with a view to their removal. It was remarkable that in all cases they were found to be present, and in some instances the fibrous bands were widespread, extending from the sciatic notch to the middle of the thigh. Lastly, in one instance, in addition to the severance of adhesions a nodule was found and removed from the sheath of the contiguous gluteal muscle."

Many observers record the palpation and excision of nodules in the muscles, but descriptions both of the

macroscopic and microscopic findings are anything but uniform. Many of the so-called *intramuscular nodules* so frequently palpated in gluteal fibrositis are not intra-muscular at all, and will be referred to later. I have never had the opportunity of inspecting *in situ* any intra-muscular nodules, but areas of cellular and fibrous infiltration occurring in muscles have been noted separately by Carey Coombs and Graff in routine serial sections of tissues. Fibrous nodules do occur in the region of the fascia lata and along the course of the tendons, especially near their insertion, and have been excised in my cases in order to determine their relation to the subcutaneous nodules occurring in rheumatic fever and rheumatoid arthritis. These fibrous nodules show a few cells of the multinuclear type with endarteritis obliterans of the vessels, but their relation to orthodox rheumatic nodules is difficult to assess.

In the type of gluteal fibrositis with referred sciatic pain, the type *par excellence* which can perhaps most justifiably be called rheumatic sciatica, palpation of tender nodules apparently lying in the gluteus medius and in the upper half of the gluteus maximus has been noted frequently. Pressure on these nodules is often extremely painful and in a series of cases it was decided to investigate their nature. Under anaesthesia a long needle was thrust into the centre of each nodule and a four-inch incision was made exposing the same. In every case the needle was found to be embedded in the centre of a circumscribed mass of fat in the *subcutaneous*, and not in the muscular tissue. There was well-marked engorgement and reddening, not only of the structures enclosing the painful fatty nodules, but of the whole network of fibrous tissue forming the mesh in which the subcutaneous fat lay, as it were, in compartments, and of its extensions both superficial and deep.

A glance at the accompanying diagram will explain

what was found at biopsy. A is the stratum corneum, B the stratum lucidum, C the stratum granulosum,

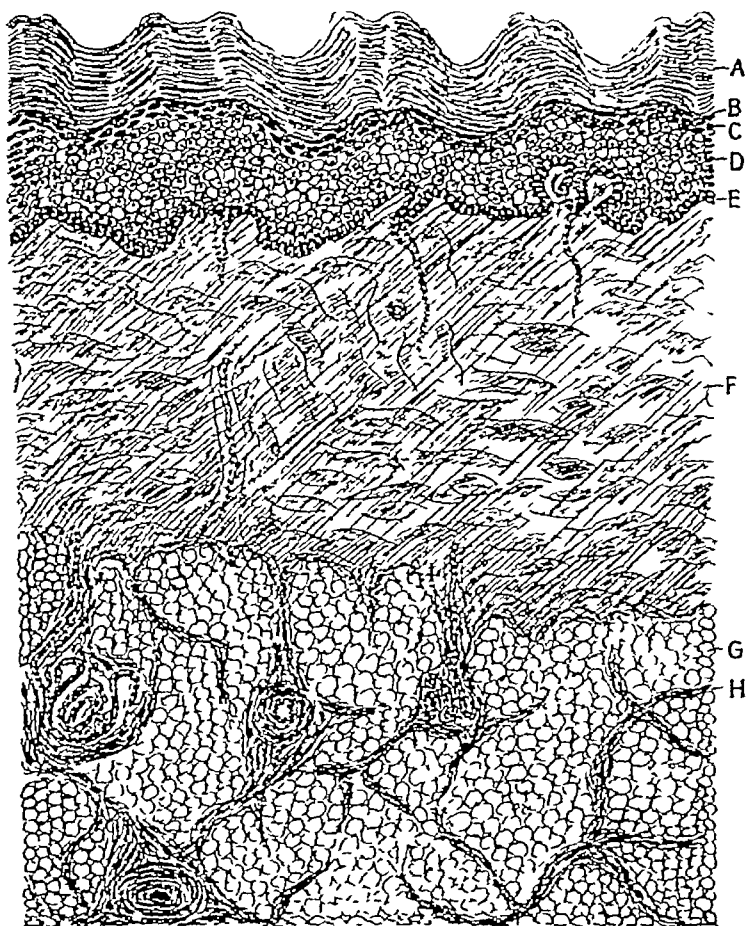


FIG 1 —A is the stratum corneum, B the stratum lucidum, C the stratum granulosum, D the stratum malpighi, E is the stratum germinativum, F is the corium with its fibrous bundles, G is the subcutaneous fat surrounded by H the trabeculae

The so-called nodules referred to as occurring in what is usually known as gluteal fibrositis are really circumscribed areas of fat G surrounded by trabeculae

D the stratum malpighi, E is the stratum germinativum, F is the corium with its fibrous bundles, G is the subcutaneous fat surrounded by H the trabeculae. In the dissection referred to above the so-called nodule was a circumscribed area of fat encased by trabeculae

which formed the envelope. Presumably tension in, or pressure upon, this mass of fat produced a pinching of the minute nerves and vessels running in the trabeculæ and the pain was thus referred to the sciatic nerve. Stockman described something of the kind in sections of panniculitis, and has proved that there is interstitial neuritis of the minute nerves referred to. His findings, however, were not exactly parallel to the above in that he described nodules in the subcutaneous tissues as being masses of *fibrous* tissue surrounded by fat and that these were the cause of pain and tenderness. It is difficult to reconcile the *fibrous* nodules in Stockman's cases with the finding of *fatty* nodules in mine, unless we can subscribe to the probability that one lesion is the outcome of the other. Thus in my series of cases biopsy was undertaken in the early stage of the disease when the inflammatory process was subacute as evidenced by inflammatory rather than fibrous reaction, whereas the fibrous reaction noted in Stockman's cases can be assumed to have occurred later in the disease or possibly subsequent to treatment. In any case the etiology is obscure. While it is obvious that a blood-borne infection or trauma can evoke engorgement of the vessels nourishing the aponeurosis covering muscle and trabeculæ budging fat spaces, yet it is not impossible that purely metabolic factors can evoke neuritis, as increase of fat in a space restricted in measure by a comparatively fixed structure of trabeculæ, might conceivably cause pressure symptoms both on vessels and nerves contained in this scaffolding.

CLINICAL PICTURE

In a case of gluteal fibrositis with referred sciatic pain a thorough and careful examination is of the greatest importance. The symptoms are usually insidious in onset and pain at first is usually not complained of as running down the leg in the course of the

nerve or in the calf or foot. As a rule the pain is not continuous, nor is it likely to occur in spontaneous paroxysms of great severity at night. A history of numbness, tingling, and a sense of coldness and weight in the leg is not usually volunteered. The points where tenderness is most easily obtained in sciatic neuritis, namely, over the sacro sciatic notch, midway between the tuberosity of the ischium and the great trochanter and below the head of the fibula, are not usually complained of, though pressure at the first sometimes evokes pain. On the other hand, the patient most characteristically places his hand over the gluteal region when explaining the site of his pain, though he may refer to this as occurring also down the back of the leg. Coughing and sudden effort evoke pain, and pain is induced in the glutei when the subject stands erect with straight knees and dorsiflexes his big toe. Complete rest and relaxation usually abolish the pain temporarily, though walking and standing aggravate it. Muscle wasting is absent except in cases of long standing, and muscle weakness is not noticeable. Scoliosis, either contralateral as in arthritis of the lumbar vertebræ to induce wider separation of the articular surfaces and enlargement of the intervertebral foramina, or homolateral, as in root or trunk sciatic neuritis to relieve tension, is generally absent.

Lasèque's sign is not very useful to differentiate this form of sciatica from others, as it is usually doubtfully positive. The ankle jerk does not disappear in an uncomplicated case of gluteal fibrositis with referred sciatic pain, but in severe cases it has been found to be less active on the affected side, suggesting that there is some degree of real neuritis in addition to the purely referred pain. This form of sciatica may be bilateral, and it is not unusual to elicit the history of other fibrositic manifestations. In common with other sciaticas, lumbago frequently initiates an attack. Gluteal fibrositis occurs in both sexes, particularly

perhaps in fat women. In a large proportion of cases of gluteal fibrositis there is a mild anxiety state, the fibrositis being, as it were, a physical peg on which to hang a mental disability.

TREATMENT

The principles of treatment of gluteal fibrositis are based mainly upon the acute or chronic character of the symptoms. In the subacute stage rest is indicated with *superficial* applications, such as antiphlogistine, mud-packs and anodyne ointments. The general health should be attended to, particularly in the matter of good food, plenty of sleep, and freely opened bowels. Obvious infective foci if easy of access should be removed, and intestinal irrigation is especially useful. Local massage is contraindicated, and this applies to diathermy and ionization. These last three treatments, when adopted in the acute stage, are, in my opinion, responsible for chronicity of symptoms. In the more chronic stage under-water douching and local massage are desirable, with such measures as gentle exercise and diathermy. A change of environment, especially to a spa, is advisable provided that optimistic society and cheerful surroundings can be arranged for.

I am greatly indebted to Dr. Delicati for the diagram in the text.

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Principles of the Orthopædic Treatment of Chronic (Non- Tuberculous) Arthritis

BY A G TIMBRELL FISHER, M C, F R C S.

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SHORTLY after the Great War, in Hunterian and other lectures based upon researches into the anatomy and physiology of the articulations, and into the pathology and treatment of chronic arthritis, carried out under the ægis of the Medical Research Council, I ventured to criticize the treatment of many injuries and non-tuberculous diseases of the joints by complete rest and splintage, and to point out that this treatment (or more correctly, absence of treatment or a policy of *laissez-faire*) was not infrequently potent in the production of a very great number of crippled, stiffened, and deformed joints, with wasted muscles and atrophied limbs. This policy was, moreover, an important cause of the existence of an army of unqualified practitioners who were thus gratuitously presented with an enormous field in which, although they occasionally did good, disasters were common owing to their crude methods and lack of proper clinical training.

In the course of this campaign against unqualified practice, much further experience has strengthened my conviction, and has brought the belief that to the doctrine of absolute rest may be attributed the unjustifiable atmosphere of pessimism surrounding chronic arthritis and its treatment. There is an urgent need

for further research into the etiology of the various forms of chronic arthritis, and the need for closer co-operation between physicians and those who specialize in the physiotherapeutic and orthopædic treatment of these cases is almost equally urgent. It is a subject for grave concern that in many of the new clinics for the treatment of rheumatic and arthritic conditions, laudable and overdue as this movement is, orthopædic treatment does not receive the attention that is so essential. Yet many of the cases at these clinics stand in urgent need of modern orthopædic treatment. Although it must be admitted that in the earliest stages, the medical treatment of arthritis is often of considerable importance, to persist in such purely medical treatment when all signs of activity have disappeared, and the disease appears to have "burnt itself out," and to neglect the vitally important orthopædic problems that then present themselves, is an example of "straining at a gnat and swallowing a camel."

Orthopædic treatment is indicated in both the earlier and later stages of arthritis. In the earlier, indeed from the first day of onset of the disease, it is mainly concerned with the prevention of deformity and the maintenance, as far as the acuteness of the disease permits, of the function of the joint. By this is meant the prevention of the formation of adhesions, and the maintenance of the musculature and normal joint mobility. In some very acute cases, the prevention of adhesions and stiffness is impossible, and it must be our aim to maintain the joint in such a position that in the event of ankylosis the joint is in the position of greatest functional advantage. At first, at any rate, deformity is mainly due to muscular spasm, and the more powerful groups of muscles, usually the flexors of a joint, overcome the less powerful extensors, so that flexion of joints becomes more and more prominent. In other joints, various other deformities, such as

abduction, adduction or rotation, may be superadded, as a result of the more powerful action of the corresponding muscular groups. In the later stages, the deformity, previously due to muscular spasm, becomes "fixed" from the formation of scar-tissue, which occurs principally on the side of greatest contracture, and affects at first the capsule of the joint and the tendons of the spasmodically contracted muscles in the vicinity of the joint, but in later stages adhesions between the articulating surfaces of the joint may occur, and may eventually ossify.

TABLE OF CHARACTERISTIC TYPES OF DEFORMITY
COMPARED WITH POSITIONS OF ELECTION
FOR ANKYLOSIS (SPINE NOT INCLUDED)

<i>Deformity</i>	<i>Position of Election for Ankylosis</i>
<i>Hand</i> — Ulnar deflection of fingers at metacarpo-phalangeal joints. Well-marked flexion at interphalangeal joints, sometimes hyper-extension at proximal interphalangeal joints.	Moderate degree of flexion at metacarpo-phalangeal and interphalangeal joints. Absence of lateral deviation.
<i>Wrist</i> — Flexion	Extension through forty-five degrees.
<i>Elbow</i> — Usually midway between flexion and extension, forearm in pronation.	Varies according to occupation and patient's wishes. Probably slightly less than 90° best. Forearm midway between pronation and supination.
<i>Shoulder</i> — Flexed, adducted, and rotated inwards.	Slight flexion, abduction through 45° (adults) or 70° (children).
<i>Foot</i> — Hallux valgus or rigidus. Toes deviated outwards at metatarso-phalangeal joints. Pronation at mid-tarsal joint with consequent flat foot.	The normal position. Slight inversion is sometimes advantageous.
<i>Ankle</i> — Plantar flexed . . .	Foot forms an angle of 90° with leg. A few degrees of dorsiflexion sometimes preferable.

<i>Deformity</i>	<i>Position of Election for Ankylosis</i>
<i>Knee</i> —Flexed In severe cases tibia is subluxated backwards and rotated outwards	Complete extension, although if ankylosis is bony, a few degrees of flexion may be of advantage
<i>Hip</i> —Flexed, adducted, and rotated inwards (late stages)	Slight abduction and rotation outwards in extension

PRINCIPLES OF ORTHOPÆDIC TREATMENT OF THE MORE ACUTE TYPES OF CHRONIC ARTHRITIS

(A) *Cases unassociated with deformity*—During the acute stages, when muscular spasm is a prominent feature, every effort must be made to prevent the onset of deformity. Although our normal aim should be to retain a useful functional degree of movement of the joint, the joint should be placed in the optimum position (q v) in case the retention of movement becomes impossible. If apparatus is deemed necessary, it should be light, comfortable, must exercise no injurious pressure on the joint itself, or upon the limb proximal or distal to the joint, and must be of a type that does not interfere with the all-important physical treatment of the joint and musculature of the limb (Fig 1). Plaster of Paris as an agent of temporary fixation is not recommended, as it has most of the undesirable qualities mentioned above, and is a potent cause of stiffened joints and wasted muscles. Where there is a marked tendency to deformity, some form of weight extension is often indicated.

The importance of physiotherapy—It is characteristic of chronic arthritis that eventually the acute symptoms subside, and the joint may become comparatively painless, although, of course, other joints may become progressively involved. Our aim, therefore, should be to direct our energies towards maintaining the nutrition of the joint, preventing deformity and ankylosis, keeping up its range of movement, and maintaining the tone of the muscles acting upon it. In this way we assist the very real reparative powers present in a joint.

(*vide* the remarkable phenomena of false joints), and when the more acute symptoms have subsided, the patient may still possess a joint retaining useful function. By the older methods of complete and uninterrupted rest, the patient was sometimes left with a

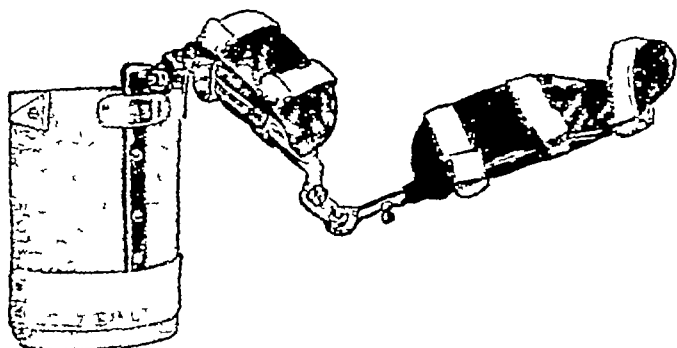


FIG 1 —Author's universal shoulder abduction splint (A. E. Evans and Son). The splint is constructed mostly of duralumin, and by the use of this metal (which is an alloy of aluminium) the weight of the apparatus is less than one half than if made entirely of steel. The splint is fitted with universal joints of a special type at the shoulder and elbow, which permit the arm to be set and fixed in any position, at the shoulder joint, for example, it is possible to alter the degree of abduction and adduction, flexion, extension, and rotation at will, and at the elbow, flexion, extension, pronation, and supination can also be adjusted. The splint is made adjustable in every way by extension slides, so that when extension is required at any joint, as in some cases of arthritis or fracture, this can readily be applied. As illustrated, the splint is eminently suitable for cases of arthritis involving all the joints of the upper extremity, but the lower sections can easily be removed for application to the elbow or wrist only. All sections are padded and covered in leather and fitted with buckles and straps. Shoulder and waist straps are attached to the body plate to hold splint firmly in position, either for right or left arm.

stiff joint for life, often in a position of deformity, and the limb was usually weak and helpless from extreme muscular atrophy.

Except in the most acute cases, great benefit will result from daily applications of radiant heat, massage of the affected limb or limbs, and carefully graduated movements, both active and assisted. Radiant heat relieves pain and muscular spasm and improves the circulation of the joint, thereby aiding the nutrition of the joint structures. It is of value in softening scar tissue and adhesions, and by its analgesic and antispasmodic action, is a valuable preliminary to

massage and careful movements

Massage.—As stated elsewhere¹, “ Unless this valuable method of treatment is practised in a proper manner, with a due regard to underlying principle, and with a clear idea in the mind of the masseur of what is aimed at in any particular case, the treatment may be not only futile, but actually harmful. Although the art of massage can, to a certain extent, be acquired, those who would attain pre-eminence therein must have certain special qualities, such as a delicacy and sensitiveness of touch, a tactful, optimistic, and sympathetic personality, and the gift of encouraging and inspiring patients to co-operate to the utmost.” The results of skilful massage by persons with these qualifications is not infrequently extraordinarily gratifying.

The closest co-operation between medical man and masseur is absolutely essential, and there are few things more futile and depressing in medicine than the practice, occasionally seen at some institutions, where the word “ massage ” is scribbled on an out-patient card, and the patient is forthwith banished to a massage department, where the masseur, although doing his best, is engaged in “ making bricks without straw,” lacking, as he so often does, the personal interest and counsel of the medical man in charge of the case.

There are a host of other modes of treatment which may be included under this category, and will doubtless be dealt with by other contributors to this symposium, all of which have their warm advocates, such as ionization (rather disappointing in the author's experience, and it is very doubtful whether the underlying physics is quite sound), diathermy (may do more harm than good in inexperienced hands, and should, except in a few special cases, always be administered by a medical man); various forms of ultra-violet treatment and electrical treatment, not only for the joints themselves, but for the wasted muscles that act

upon the joint

Avoidance of faulty posture—In recumbent cases particularly, an insidious type of flexion deformity of hips, knees, and ankles is liable to occur, because the patient is propped up in a bed with the knees flexed over a pillow, and without precautions to prevent the weight of the bed-clothes from gradually forcing the feet into a position of talipes equinus or equinovarus. This characteristic syndrome of deformity is far too frequently encountered, and it is a short-sighted policy if the medical attendant, in an attempt to make the patient easier, allows these dangerous positions to persist.

(B) *More acute cases in which deformity has supervened*—It is preferable to correct any deformity present by continuous extension, rather than by manipulation, and certain mechanical points concerning the application of such extension are very important, for extension, if wrongly applied, may cause increased pressure between diseased articulating surfaces, increase pain and muscular spasm, and thus do far more harm than good. Correction of deformity by weight extension finds its principal indications in the lower extremity, and the mechanical principles

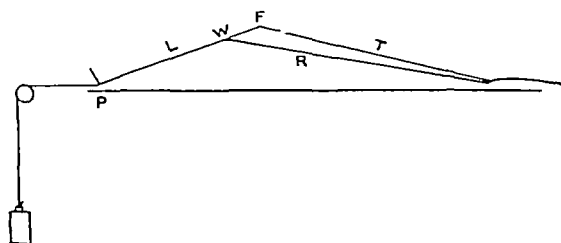


FIG. 2

L	Leg	T	Thigh	P	Power
F	Fulcrum			R	Resistance

Extension force acting as lever of second order in case of knee

in applying weight extension to the flexed knee-joint in the presence of active disease, can, perhaps, best be indicated diagrammatically (Fig. 2). This illustrates a

massage and careful movements.

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that the weight is excessive. Weight extension is sometimes useful in disease of joints of the upper extremity, especially the shoulder, and the same principles must be applied. As mentioned above, weight extension is not infrequently indicated in severe cases with the object of preventing the occurrence of deformity, where the ordinary measures outlined above are inadequate for this purpose.

PRINCIPLES OF ORTHOPÆDIC TREATMENT OF THE MORE CHRONIC TYPES OF ARTHRITIS

1. That the psychological factor is of outstanding importance in almost every case of chronic arthritis has never received the attention it deserves. Depressed, doubtless, by the examples of the bad old methods that abound on every side, well-meaning but tactless friends and relations have usually succeeded in conveying to the sufferer the impression that he or she is suffering from an incurable disease, and that nothing can be done to prevent the onset of hopeless and helpless crippledom. At the outset, therefore, this demon of doubt and depression must, if possible, be exorcised; this usually necessitates a careful study of the patient's home life and surroundings, and the Job's comforter usually lurking in the background must be tactfully warned. When this evil influence persists, an effort should be made to remove the patient therefrom. Not infrequently, relations and friends of the arthritic in an attempt to be helpful, assist the patient in the performance of many things that the patient is perfectly capable of doing, and, indeed, should be encouraged therein. There is no surer way of assisting the onset of helplessness, and conversely, patients who have the necessary strength of mind to insist on relying more upon their own efforts than upon those of others, can often defy the onset of crippling stiffness in a remarkable manner. It is clear, therefore, that the personalities of the

patient, of the patient's friends, and of the medical man, are all most important factors in this complex and difficult problem

(A) *Cases unassociated with deformity.*—The same general principles apply as in the more acute cases unassociated with deformity with certain modifications. In the present group, muscular spasm is not so conspicuous, but nevertheless is usually present, and very insidious, and the more gradual onset of deformity must be particularly guarded against. Actual weight extension is very rarely indicated, and the physiotherapeutic principles mentioned above are of great importance. Our aim should be to put the joint through its full range of movement daily in order to prevent the formation of adhesions and stiffness, and steps must be taken to overcome the tendency to muscular atrophy, for example, by graduated exercises and faradic stimulation.

In some cases, particularly in the lower extremity, and in the hip and knee-joints, where pain due to the approximation of diseased articular surfaces is prominent, some form of ambulatory "destressing" apparatus may help in relieving pain, in permitting the patient to take a certain amount of exercise with its resulting beneficial effects upon the general health, and in preventing the onset of deformity. Most of these ambulatory forms of apparatus are constructed upon the principle of the Thomas walking calliper. Very accurate fitting is essential; the weight must be borne above mainly by the ischial tuberosity, and on no account, as is sometimes seen in wrongly constructed forms of apparatus, by the structures on the inner and upper third of the thigh. When pain is very severe, a period of complete rest from weight-bearing must be obtained by putting the patient to bed for a few weeks, during which period, however, physiotherapy must be continued regularly. This period can often be advantageously utilized in a simultaneous

thorough investigation of the patient by physician and pathologist.

(B) *Chronic cases associated with deformity.*—It can scarcely be sufficiently emphasized that nearly all deformity should be preventable by attention to the simple principles enunciated above, and that, judging from the enormous number of deformed joints seen by any busy orthopædic surgeon, these principles are still very far from being generally realized. The most frequent deformity is a joint which has become fixed to a greater or lesser degree by adhesions in some position which is functionally disadvantageous. Every degree of stiffness may occur, from that of a joint with its movement but slightly restricted by fibrous adhesions, either intra-articular or capsular, or both combined, to a joint which is firmly ankylosed either by dense fibrous tissue or by actual bone. The characteristic deformities due to this cause are enumerated above. Less frequently, deformity may be due to attrition of the articular surfaces and laxity of the surrounding ligaments, causing some degree of flail joint, to synovial effusion, or to enlargement of the articular ends by osteophytic developments. The treatment to be adopted in the stiffened and deformed joint depends in great measure upon the degree of stiffness and deformity and consequent interference with function, and also upon the joint involved. Much depends also upon the age and general condition of the patient, and the presence or absence of signs of recent active disease in the joint itself, or in other joints.

In these chronic cases, long-continued spasm of the flexors and other powerful groups of muscles has often led to actual shortening of the muscles and their tendons by interstitial fibrosis, and to adaptive changes in the fibrous sheaths of blood-vessels and nerves. In many severe cases, the cancellous tissues, and even the compact bone of the articular and juxta-articular bone, undergo atrophic changes. It will thus be seen that, whereas

lateral steel supports of the leg piece in such a manner that an extending force is steadily brought to bear upon the flexed knee

Surgical operations—Although open surgical operations are necessary in a minority only of cases of chronic



FIG 4—Ambulatory apparatus for straightening flexed knee

arthritis, they may be of great value. Space will only permit of a very brief reference to this subject. Broadly speaking, surgical operations are indicated when all simpler measures have failed, for the correction of some gross deformity that constitutes a serious disability, to restore mobility to a stiff joint, to remove loose bodies that may be causing painful locking, and for other reasons, the ultimate aim of which is to retain mobility in the affected joint. On the other hand, a surgical operation may rarely be necessary in order to bring

about ankylosis of the affected joint, either on account of severe pain, or owing to a flail condition. In conclusion, the new orthopædic surgery has great potentialities for the relief and improvement of patients crippled or threatened by crippling by the various forms of chronic arthritis.

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The Relationship of Affections of the Throat, Nose and Ear to Rheumatic Disease

By C HAMBLÉN THOMAS, F R C S

Laryngologist to the British Red Cross Clinic for Rheumatism, Assistant Surgeon to the Throat and Ear Department, West London Hospital, and to the Metropolitan Ear, Nose and Throat Hospital

THE responsibility of diseases of the throat, nose and ear for rheumatic conditions is much debated. Some consider that the importance of disease in these areas has been greatly exaggerated, more especially by the specialist, others argue just as hotly on the other side. But, as is often the case, a mean between the two is probably the more correct view, and many cases of rheumatism are due to more than one cause.

Having always been interested in arriving at a true assessment of the primary focus in rheumatism, when patients have consulted me for throat, nose or ear conditions, I have been in the habit of inquiring particularly for any rheumatic manifestations. Rheumatism, more especially in the chronic forms, has been classified in many ways, but I use the term in its widest sense to cover acute and chronic forms affecting the heart, joints, muscles, and nerves and I propose to consider its incidence in cases of focal sepsis as well as the occurrence of focal sepsis in rheumatism.

In this article the juvenile form of the affection will first be considered, and I will commence by considering the prevalence of rheumatism among the usual tonsil and adenoid cases that are referred by physicians because the children are not doing well and not because

21 complained of rheumatic symptoms, but probably the proportion would have been higher if they had been more closely watched. It is noteworthy in this relation of tonsil infection to rheumatism that although one sees more chronic pharyngitis in men, women appear to be greater sufferers from rheumatism. The proportion at the British Red Cross Clinic, Peto Place, works out at six of women to four of men. The explanation of this is uncertain, but it may be because women are more subject to endocrine disturbances, it may be the local infection is more deep-seated, or it may be that women can better spare the time for treatment.

Of the patients referred to me for investigation at the Rheumatism Clinic, the women outnumber the men in the proportion of four to one. I have always found that the age of middle life in a woman is a critical time for the onset of rheumatism, although she may have had sore throat for years previously. For this reason I advise women especially to have diseased tonsils removed at an early age. One case in a woman is of particular significance in that she dated her tonsillitis and rheumatism from a pregnancy.

Of those patients who attended the Rheumatism Clinic over a period, 3-4 per cent were referred for investigation of their throats, noses or ears as a possible source of causal infection. 6 per cent. of these showed no evidence of throat, nose or ear disease; 75 per cent showed definite tonsillar disease, 18 per cent. showed sinus infection; and 2 per cent had chronic running ears.

In estimating the condition of the tonsil as a focus of disease the size is not the prime consideration, although in the adult the tonsil should be small, if normal. A small tonsil may be much more poisonous than a large one, and this applies especially to the small scarred remains, the result of previous operations, such as partial removal or cauterization. Scarring obstructs the orifices of the tonsillar crypts and dams up any infection present so that absorption is

encouraged much as in the apical abscess of a tooth

In diseased tonsils pus can often be expressed by pressing on the tonsil behind the anterior pillar, or the anterior pillars appear dusky and finely speckled, or there is a cervical adenitis. In many cases the evidence of infection is small compared with the state of the tonsil as found at operation. For instance, a retro-tonsillar abscess containing as much as 20 minims of pus is not an uncommon occurrence, and, incidentally, when one sees this deep-seated abscess one appreciates the futility of trying to cure the disease by surface applications.

Amongst adults nasal sinus trouble was present in 18 per cent of all the nose and throat cases inspected for a possible source of their rheumatism. Their chief symptoms referable to their nasal condition were frequent colds, post-nasal droppings, nasal obstruction, pain referred to the scalp, occipital region, frontal region between the eyes, or the region of the ear, and one case complained of hay-fever.

On examination, many showed enlarged lateral lymphoid columns posterior to the posterior faucial pillars, and others glazed posterior pharyngeal walls. Pus crusting and polypoid mucous membrane were not always seen. A thorough investigation was made by speculum, mirror, transillumination, X-rays, and wash-outs. Where there is any suspicion of sinus infection it is necessary that the examination should be very thorough so that no sinus may be overlooked, especially the posterior ethmoidal and sphenoidal cells.

Unfortunately, only half the patients advised to have nasal treatment carried it out, and of those who did, 70 per cent had their rheumatism improved, the remainder deriving apparently no benefit. The treatment varied from nasal douches to extensive operative interference, but many required only antrum puncture and wash-out, all sinus operations were intranasal.

The causation of rheumatism by a chronic ear

dition is very rare. But the reverse, the association of ear conditions, such as chronic middle-ear deafness and tinnitus, with rheumatism is not at all uncommon. Chronic running ears were found in only 2 per cent of the rheumatic cases attending the throat department, and in only one case were the nose and pharynx healthy. Those chronic discharging ear cases that had rheumatism and diseased tonsils improved in their rheumatism on removal of their tonsils.

The duration of the tonsillitis with reference to the duration of the rheumatism is interesting. A number of cases had had throat symptoms for many years, even from childhood, without rheumatism developing until lately, but, as mentioned above, in women they eventually developed rheumatism at about the age of 35 to 45 years.

Rheumatism definitely originated after a sore throat in 15 per cent. of all the throat cases examined, and in only one of these was a quinsy a precursor. Most commonly a latent period exists before the onset of rheumatism.

A history of quinsy was given in only 7 per cent. of those with tonsillar disease, and only a small number complained of adenitis, and had palpable glands in the neck. A few had had their tonsils partly removed in childhood.

The organisms that were isolated from the diseased tonsils in the pharynx or after their removal were most commonly *Streptococcus hæmolyticus*, then *Streptococcus non-hæmolyticus*, *Streptococcus viridans*, pneumococcus, *Staphylococcus albus* or *aureus*.

DENTAL SEPSIS AND RHEUMATISM

In 8 per cent. of all cases sent to the throat department, the teeth were suspect in about half the cases, and treatment of these led to disappearance or amelioration of symptoms. Diseased teeth were frequently a hidden cause of nasal or pharyngeal disease, apart from

being directly responsible for more generalized disease, and for this reason it is a wrong policy to treat a nose or throat where the teeth are under suspicion. Bearing on this inter-relation of teeth and pharyngeal infection, one case had a severe reaction in the gums on removal of the tonsils.

TREATMENT

80 per cent of the cases with diseased tonsils were advised to have them removed by dissection, and 20 per cent were given a throat paint, either because it was more convenient to the patient or because an operation was inadvisable at the time. Those using a throat paint showed an improvement in half their number, but it must be known that they were undergoing general treatment at the same time, so how much was due to the paint it is difficult to say. The paint usually employed in these cases is guaiacol in olive oil (3ij to 3j), but its results can only be good in a superficial pharyngeal infection.

It is always advisable to remove tonsils by dissection, even in children, as the trauma is less, and for this reason the risk of flooding the system with toxins is lessened; also the removal is more complete. Infected tonsillar remains are more dangerous than the infected complete tonsil, and any treatment causing scarring of the tonsils is especially to be condemned.

Before operating on a child it is beneficial to give syrup fern phosph 30 to the child for a week, and in all cases there should have been no recent acute infection. An injection of anti-scarlatinal streptococcal serum is a safeguard against a severe reaction in both throat and nose operations on acute or subacute rheumatic cases.

Medical diathermy, X-ray and radium treatment, and ionization may produce a temporary sterilization of the diseased tissue, and suction may drain away some infection, but none of these can produce a lasting

which occur in female practice.

Reference will be made to 158 cases seen between June 30th, 1928, and November 30th, 1930, these cases are consecutive, therefore non-selected, and each has been analysed in detail and charted individually (for safe checking) regarding history and symptoms. Forty points were enquired into in each case and collected in Table A (1), 7 cases (either "non-rheumatic," or "history incomplete") were removed; a final total of 151 cases.

CHART A (1)
Analysis of 158 Cases

	Total Nos.	Percentage No 151* Rheumatic Cases.
Leuco-xanthorrhœa - - - -	103	68 21
Brown discharge - - - -	8	5 29
Adolescent "whites" - - - -	42	27 81
Rheumatism in pregnancy - -	3	1 98
Rheumatism within 2/12 of labour -	16	10 59
†Hæmorrhage with labour - - -	14	9 27
‡Prolonged red lochia - - - -	40	26 49
Adherent placenta - - - -	4	2 64
Frank puerperal pyrexia - - -	15	9 93
or other pelvic infection history -	19	12 58
Other pelvic infection sign (tubes) -	17	11 25
Chronic inflam thickening (parametritis, etc) - - - - -	30	19 86
Erosion - - - - -	98	64 9
Erosion bleeding freely - - - -	10	6 62
Cervix with Naboth's - - - -	14	9 27
Cervix with patent internal os - -	17	11 25
Cervix torn - - - - -	31	20 52
Cervix bleeding but no erosion - -	6	3 97
Urethral involvement - - - -	51	33 77
Bartholinitis - - - - -	8	5 29
Vaginitis or vulvitis - - - -	14	9 27
Heavy menstrual periods - - - -	22	14 57
Scanty menstrual periods - - - -	9	5 96
Early menopause - - - - -	7	4 63
Rheumatism after menopause - - -	11	7 28
Sterility (involuntary) - - - -	11	7 28

* 7 cases removed as 4 non rheumatic, 3 history incomplete

† 7 hæmorrhage at labour only, without prolongation of lochia

‡ 7 hæmorrhage at labour and prolonged red lochia.

§ 33, no hæmorrhage, but prolonged red lochia after

§ i.e. 47 or 31 1 per cent undue "loss" in childbed

	Total Nos	Percentage No. 151 Rheumatic Cases
Sterility ' 1 child ' - - - -	20	13 24
Cases referred for surgery or investiga- tion (anæsthesia) - - - -	68	45 03
Malignant or ? pre-malignant - - - -	11	7 28
Polyp (seen or history) - - - -	10	6 62
Cysto- or recto-cele - - - -	24	15 89
Uterine descent - - - -	13	8 6
Pruritus - - - -	12	7 93
Leucoplakia - - - -	3	1 98
Sinus or tonsillar sepsis - - - -	17	11.25
Dental sepsis - - - -	10	6.62
Rheumatic fever or St Vitus' dance history - - - -	16	10 59
Rheumatism and scarlet fever - - - -	2	1 32
Rheumatism and influenza - - - -	2	1 32

"Chronic pelvic sepsis" suggests the clinical picture of cases with uterine discharge, possibly with heavy menstrual periods, even semi-invalidism seven and more days each month, cases with or without back-ache and "bearing down" discomfort, but usually showing signs of toxæmia, often with frequent or pain-micturition and sometimes even frank cystitis or vaginitis. These cases often have excessive or continued labour, or marked "after-pains," sometimes "text-book" sepsis, and frequently give a picture of "whites" in adolescence, so much so that regard that girl with "whites" in adolescence as a woman who will probably have trouble in the future or may develop pelvic ill-health or quite some form of rheumatism.

CHART B (1)

Nine Consecutive Cases

	A	1	2	3	4	5	6	7	8	9	Total
1	-	+	-	+	-	+	+	-	-	+	4
2	-	+	-	-	-	-	-	+	+	+	5
3	-	+	-	-	-	-	-	-	-	-	1
4	-	-	-	+	-	+	+	-	+	-	4
5	-	+	-	+	+	-	-	-	-	-	3
6	-	-	-	+	-	-	-	-	-	+	2

No 4 non rheumatic.

which occur in female practice.

Reference will be made to 158 cases seen between June 30th, 1928, and November 30th, 1930, these cases are consecutive, therefore non-selected, and each has been analysed in detail and charted individually (for safe checking) regarding history and symptoms. Forty points were enquired into in each case and collected in Table A (1); 7 cases (either "non-rheumatic," or "history incomplete") were removed; a final total of 151 cases.

CHART A (1)
Analysis of 158 Cases

	Total Nos.	Percentage No 151* Rheumatic Cases.
Leuco-xanthorrhœa - - - -	103	68 21
Brown discharge - - - -	8	5 29
Adolescent "whites" - - - -	42	27 81
Rheumatism in pregnancy - -	3	1 98
Rheumatism within 2/12 of labour -	16	10 59
†Hæmorrhage with labour - - -	14	9 27
‡Prolonged red lochia - - - -	40	26 49
Adherent placenta - - - -	4	2 64
Frank puerperal pyrexia - - -	15	9 93
or other pelvic infection history -	19	12 58
Other pelvic infection sign (tubes) -	17	11 25
Chronic inflam thickening (parametritis, etc) - - - -	30	19 86
Erosion - - - -	98	64 9
Erosion bleeding freely - - -	10	6 82
Cervix with Naboth's - - - -	14	9 27
Cervix with patent internal os - -	17	11 25
Cervix torn - - - -	31	20 52
Cervix bleeding but no erosion - -	6	3 97
Urethral involvement - - - -	51	33 77
Bartholinitis - - - -	8	5 29
Vaginitis or vulvitis - - - -	14	9 27
Heavy menstrual periods - - -	22	14 57
Scanty menstrual periods - - -	9	5 96
Early menopause - - - -	7	4 63
Rheumatism after menopause - -	11	7 28
Sterility (involuntary) - - -	11	7 28

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	Total Nos	Percentage No 151 Rheumatic Cases
Sterility ' 1 child ' - - - -	20	13.24
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Polyp (seen or history) - - - -	10	6 62
Cysto- or recto-cele - - - -	24	15 89
Uterine descent - - - -	13	8 6
Pruritus - - - -	12	7 93
Leucoplakia - - - -	3	1 98
Sinus or tonsillar sepsis - - - -	17	11 25
Dental sepsis - - - -	10	6 62
Rheumatic fever or St Vitus' dance history - - - -	16	10 59
Rheumatism and scarlet fever - - - -	2	1 32
Rheumatism and influenza - - - -	2	1 32

"Chronic pelvic sepsis" suggests the clinical picture of cases with uterine discharge, possibly with heavy menstrual periods, even semi-invalidism seven and more days each month, cases with or without back-ache and "bearing down" discomfort, but usually having signs of toxæmia, often with frequent or painful micturition and sometimes even frank cystitis or pyelitis. These cases often have excessive or continued loss at labour, or marked "after-pains," sometimes even "text-book" sepsis, and frequently give a history of "whites" in adolescence, so much so that I now regard that girl with "whites" in adolescence as the woman who will probably have trouble in labour, or may develop pelvic ill-health or quite possibly some form of rheumatism.

CHART B (1)

Nine Consecutive Cases

	A	1	2	3	4	5	6	7	8	9	Total
Leuco xanthorrhœa - - - -	-	+	-	-	+	+	-	-	+	+	4
Adolescent whites - - - -	-	+	-	+	-	-	+	+	+	+	5
Rheumatism in pregnancy - - - -	-	+	-	-	-	-	-	-	-	-	1
Rheumatism within 2/12 of labour - - - -	-	-	-	+	+	+	-	+	-	-	4
Hæmorrhage at labour - - - -	-	+	-	+	+	-	-	-	-	-	3
Red lochia, prolonged - - - -	-	-	-	+	-	-	-	-	-	+	2

* Case No. 4 non rheumatic.

	A	1	2	3	4	5	6	7	8	9	Total
Frank puerperal sepsis -	-	-	-	-		+	+	-	-	-	2
Other pelvic infection history -	-	-	-	-		+	-	-	-	+	2
Erosion -	-	+	-	+		+	+	+	-	+	6
Naboth's -	-	-	-	-		-	-	-	+	-	1
Erosion bleeding freely -	-	+	-	-		+	-	-	-	-	2
Torn cervix -	-	+	-	-		+	-	-	-	+	3
Cervix bleeding, no erosion -	-	-	-	-		-	-	-	+	-	1
Patent internal os -	-	+	-	+		+	-	-	+	-	4
Chr inflammatory thickening -	-	-	-	-		+	+	-	-	-	2
Urethral involvement -	-	-	+	+		+	-	-	-	+	4
Bartholinitis, duct or glands -	-	-	-	-		-	-	+	-	-	1
Heavy menstrual periods -	-	+	-	+		+	-	+	-	-	4
Bleeding after menopause -	-	-	+	-		-	-	-	-	-	1

* Case No 4 non rheumatic

Of the first 9 cases quoted, 8 illustrate this connection between adolescent whites excessive loss and (or) sepsis, at labour and (or) the development of subsequent rheumatism

Case 1A—Mrs C Muscular rheumatism, onset 19 years ago when 7 months pregnant Heavy loss at labour, then lost use of left side “Whites” since young girl, now is “never clear” (discharge sometimes yellow and offensive)

Case 3A—Mrs S Rheumatism in back, unable lift or pull, since long labour 13½ years ago (no instruments or CHCl₃), “flooded 3 hours before delivery,” bled steadily 7 weeks, then gradual “loss” 6 months “Whites” since adolescence

Case 8A—Mrs R Rheumatoid arthritis 20 years 1 living child, then 3 miscarriages and 1 still-birth, all in 6 years, then rheumatism came on and menorrhagia ? Precancerous uterus now “Whites” from adolescence

Case 9A—Mrs D Rheumatoid arthritis 7 years, onset 4 weeks after second labour, red lochia 2–3 weeks (in bed 4 weeks), then yellow offensive discharge up to date “Whites” as a young girl

In 5 of the 7 child-bearing women, rheumatism came on in pregnancy in the one case, and in 4 others directly associated with labour, 2 others (7A and 8A) had rheumatism, an unsatisfactory uterine history, and cervical sepsis was found (no history of lying-in sepsis), 5 had had “adolescent whites”

Case 8A—1 living child, then 3 miscarriages, then a still-birth 6/12 later, rheumatism and heavy periods developed after the last miscarriage

One of the 9 patients, a single woman, was suggestive of malignancy

Chart B (2) summarizes the history in 8 other cases selected from the 151 to illustrate the connection

between pelvic ill-health and rheumatic disease.

CHART B (2)

Eight Cases

	A	A	A	A	A	A	B	B	Total
	18	19	36	41	49	82	8	8	
Leuco xanthorrhœa - - -	+	-	+	+	+	+	+	+	7
Adolescent "whites" - - -	+	-	+	-	+	-	-	+	4
Rheumatism in pregnancy - - -	-	-	-	-	-	-	-	-	0
Rheumatism within 2/12 of labour	+	+	-	+	-	-	-	-	3
Hæmorrhage, at labour - - -	-	-	-	-	+	-	-	+	2
Red lochia, prolonged - - -	-	+	+	-	+	-	+	-	4
Adherent placenta - - -	-	+	-	-	+	-	-	-	1
Frank puerperal sepsis - - -	-	-	+	-	-	-	-	-	1
or other pelvic infection history	-	-	+	-	-	+	+	-	3
Erosion - - - - -	+	+	+	+	+	+	+	+	8
Naboth's - - - - -	-	-	-	-	+	+	-	-	2
Erosion bleeding freely - - -	-	-	-	-	-	-	-	+	1
Torn cervix - - - - -	-	-	+	-	-	+	-	+	3
Cervix bleeding, no erosion - - -	-	-	+	-	-	-	-	-	1
Bleeding after menopause - - -	-	-	-	-	-	-	-	-	0
Patent internal os - - - - -	-	-	-	+	-	-	-	-	1
Chronic inflammatory thickening	+	-	+	-	-	+	-	+	4
Urethral involvement - - - - -	+	-	-	+	+	+	-	+	5
Bartholinitis - - - - -	-	-	-	-	-	+	-	-	1
Heavy menstrual periods - - -	-	+	-	-	+	-	-	-	3
Sterility - - - - -	+	-	-	-	-	-	-	-	1

Case 82 was a most difficult case to find any link in, but, as acute rheumatism developed within a few days of feet being "wrenched," it suggested a septic focus disturbed, this was not negatived by ensuing pleurisy and pneumonia, the joints were so bad that she was a year in bed

Like Case 82, Case 49 shows the undesirability of disturbing, without entirely removing, a septic focus

Case 49A—A 4-para, excessive "whites" after three labours, at fourth adherent placenta, red lochia 6/52, M P heavy since (7 days with clots "like liver") and yellow offensive discharge "Womb, tubes and ovaries removed two years after last labour, for clots and discharge," then rheumatism developed "Whites" from youth Exam infected cervix left (Naboth's, and big erosion)

Case 41 shows uterine and dental sepsis, and Case 6B uterine and tonsillar sepsis

Case 41A—July, 1928, miscarriage, August, joints affected, November, hands deformed, yellow discharge 1929, curetted elsewhere and dental sepsis treated, "some improvement" Exam (1930) erosion, muco-purulent discharge Teeth "horrible"

Case 6B—Rheumatic fever four years ago Sore throats Dry labour 7/12 ago, red lochia for 3½/12, breast abscess 2½/12, then tonsillitis Rheumatism developed 4/12 after labour, just two weeks after red lochia had ceased Now left sided pain, increasing, and discharge Exam erosion, left and right adnexæ tender, left parametric thickenings

This co-relation is frequent and experience teaches

	* A 1 2 3 4 5 6 7 8 9									Total
Frank puerperal sepsis -	-	-	-	-	+	+	-	-	-	2
Other pelvic infection history -	-	-	-	-	+	-	-	-	+	2
Erosion - - - -	-	+	-	+	+	+	+	-	+	6
Naboth's - - - -	-	-	-	-	-	-	-	+	-	1
Erosion bleeding freely -	-	+	-	-	+	-	-	-	-	2
Torn cervix - - -	-	+	-	-	+	-	-	-	+	3
Cervix bleeding, no erosion -	-	-	-	-	-	-	-	+	-	1
Patent internal os - -	-	+	-	+	+	-	-	+	-	4
Chr inflammatory thickening -	-	-	-	-	+	+	-	-	-	2
Urethral involvement -	-	-	+	+	+	-	-	-	+	4
Bartholinitis, duct or glands -	-	-	-	-	-	-	+	-	-	1
Heavy menstrual periods -	-	+	-	+	+	-	+	-	-	4
Bleeding after menopause -	-	-	+	-	-	-	-	-	-	1

* Case No 4 non rheumatic

Of the first 9 cases quoted, 8 illustrate this connection between adolescent whites excessive loss and (or) sepsis, at labour and (or) the development of subsequent rheumatism.

Case 1A—Mrs C Muscular rheumatism, onset 19 years ago when 7 months pregnant Heavy loss at labour, then lost use of left side “Whites” since young girl, now is “never clear” (discharge sometimes yellow and offensive)

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Chart B (2) summarizes the history in 8 other cases selected from the 151 to illustrate the connection

Chronic Rheumatism and the Endocrine Glands

By G R P ALDRED-BROWN, B.M., B Ch
Physician to the Royal Mineral Water Hospital, Bath

AND A GORDON WATSON, M.D
*Physician to the Royal Mineral Water Hospital, Bath, Physician in
Charge of the Physio-Therapy Department, Royal United
Hospital, Bath*

THAT the endocrine glands have a close connection in the disease of chronic rheumatism is now more than a hypothesis; but it is only of recent years that this has been fully realized. It is, however, often impossible to differentiate as to whether the endocrine gland or glands institute or contribute to the condition, or whether the changes in the glands are secondary to chronic rheumatism. Attention has been directed recently to the activities of the endocrine glands by Sir E Sharpey-Schafer's Purser lecture on endocrine physiology. It is well brought out in this lecture that modern physiology is based on chemical regulation, whereas the old physiology was based on nervous regulation. It is now realized that the functions of the organs are not governed solely by nerves, but are influenced by chemical substances in the blood, the nerves and nerve-centres being themselves subject to chemical reaction.

When the rôle of each individual endocrine gland is examined, it will be perceived that practically every gland, as far as our knowledge goes, has a dual function at least and sometimes three or more. A further complication arises in that all these glands are definitely inter-related, thus two glands may be antagonistic in their reactions, whilst another two glands may be

supplementary to each other. The products of these glands are termed autacoids, the word autacoid has been coined from the Greek "acoid," meaning drug-like. Autacoids are divided into two groups, hormones and chalones, according to whether they have a stimulating or restraining influence

Whilst our knowledge of the functions of the endocrine glands has been advanced by the physiologists in recent years, much still remains as a mystery. Our difficulties increase when a dysfunction of one of these glands occur. For there is, firstly, a great reserve inherent to each gland, which is not called upon until the disease has broken down its last barriers, and secondly, while the reserve force is being used up, a supplementary gland may be able of itself to support the diseased gland, so that no evidence of dysfunction of the first gland appears either clinically or to the apparent detriment of the patient

So far function-tests for these endocrine glands are few and far between. The pancreas has a treble rôle, secreting one external product and two internal autacoids, whilst we have at our disposal a test that shows if the pancreas is deficient in secreting one of its autacoids—namely, insulin, by means of the sugar tolerance test, this test is only an indirect one, since it really denotes the capacity of the liver to store away glucose as glycogen from the blood-stream, thus for the test to be relied upon as a test for pancreatic autacoid function, it is necessary to pre-suppose the integrity of the liver. It must further be noted that this same test has been utilized as a liver-function test and is considered by many writers to give the earliest indication of liver dysfunction. The thyroid gland secretes several autacoids, possibly the most important being that of thyroxine. Statistics show that the age and sex incidence of exophthalmic goitre closely resemble that found in the infective type of chronic arthritis. It is not at all uncommon to find amongst our cases of

rheumatoid arthritis marked evidence of both a positive von Graefe's sign and a positive Stellwag's sign. On an analogy with exophthalmic goitre this is only attributable to an excess of thyroid endo-secretion, the thyroxine autacoid. It would be expected that a study of basal metabolism in these cases would shed light on this point, but the majority of observers are agreed that there is no constant alteration in basal metabolism from normality indicative of the chronic rheumatic state. Further, there can be little doubt that a type of arthritis known as menopausal arthritis, occurs almost invariably in women presenting the syndrome of hypothyroidism, namely, dry skin, blue extremities, and so forth.

This menopausal arthritis and the functions of the ovaries are closely inter-related, of this there is no doubt. Moreover, it is believed that the endocrine system plays the major part in the production of this condition, whether the climacteric be natural or artificially produced. As has been said before, this type of patient is usually hypothyroidic.

As pointed out by Sharpey-Schafer, there is an intimate correlation between certain autacoids secreted by the ovaries, the pituitary and the thyroid. It may well be that our administration of desiccated thyroid gland, ovarian gland, and combinations of mixed glands, given empirically in this condition, stimulate or restrain the necessary autacoids of the body, for it is a fact that the judicious use of these glandular extracts relieves, and in many cases cures, this type of chronic arthritis, "menopausal arthritis."

When we consider the liver, we realize still more the tremendous gaps in our knowledge of its functions. That the liver has at least one autacoid, and that a highly important one, acting on the hæmo-poietic system, is a discovery of recent years, and due in great part to the work of Minot and Murphy, this has resulted in the "liver treatment" of pernicious

anæmia. We believe that the liver as an organ secretes other, and as yet undetermined, important autacoids. To instance one interesting line of research in this direction we would single out Oriel's isolation of a urinary "proteose" in allergic conditions, we think that this may possibly partake of the nature of an autacoid. That autacoids can be excreted in the urine is now well known, and, moreover, certain autacoids of the pituitary and the ovary can be detected in the blood and the urine. On this premise rests the basis of the Ascheim-Zondek test for pregnancy. In certain cases of allergic diseases, the intradermal injection of the urinary proteose can definitely ameliorate the allergic condition. It has been tried out in chronic rheumatism, and, as far as our experience of this treatment goes, benefit may occur in certain cases. It is our opinion that this proteose dermal reaction may conceivably prove to be a delicate and early test for liver dysfunction. Should this be the case, we feel that an advance at least in early diagnosis will have been made, comparable to the sedimentation test, but of a more specific nature. For, to our minds, the liver and certain forms of rheumatism are intimately connected.

The Value of X-rays in Chronic Arthritis and Exophthalmic Goitre

By F. HERNAMAN-JOHNSON, M.D., D.M.R.E.

Radiologist to the French Hospital, London, Honorary Physician-in-Charge X-ray Department, Croydon General Hospital

SO much has been said and written in the past few years about the use of X-rays in malignant disease, that the public, both medical and lay, is in some danger of forgetting that radiation has a value in many less serious maladies—maladies which are, nevertheless, of great importance, owing to the pain and disablement to which they give rise. I do not refer to skin diseases, in many of which the use of X-rays has become a routine treatment, except to point out, in passing, that the power of X-rays to cut short an acute attack of erysipelas is by no means as widely recognized as it ought to be.

X-RAYS IN CHRONIC ARTHRITIS

One recent and successful extension of the field of radiotherapy has been in the treatment of certain forms of chronic arthritis. The classification of the so-called "rheumatic diseases" is even to-day in a somewhat chaotic state, but for the purposes of radiotherapeutics a comparatively simple division of cases is sufficient. To take first of all the type in which X-rays have least effect. The term "rheumatoid arthritis" best describes this, in England at any rate. In a typical case there is wasting of the interosseal muscles, ulnar deflection of the fingers, absorption of interphalangeal cartilages, and fusion of the carpal bones. Many joints are affected, the most usual, in addition to those of the hands, being the shoulders and

knees. Radiographically the changes are seen to be atrophic; there is no formation of osteophytes. Left to itself the disease runs a variable course. Periods of improvement are succeeded by sub-acute exacerbations, each of which leaves the patient permanently worse. In a few instances the disease seems to die out in late middle life, leaving, of course, organic deformity in its train. X-rays, of themselves, can effect little permanent benefit in such cases, but may succeed in causing temporary improvement in particular joints where diathermy and similar means have failed.

X-rays show their most striking results in another group of cases, namely, in osteo-arthritis of hypertrophic type where the trouble is localized in the hips or spine. The existence of pronounced radiographic changes does not preclude clinical improvement of a remarkable kind. This may occur without any variation in the X-ray picture, and is difficult to explain. It does, however, seem to me that radiotherapeutic treatment enables the patient to make use of the full range of movement which is mechanically permitted. This is always much greater than the apparent range, which is limited by pain and spasm. The patient in a successful case comes to move the affected joint freely to an extent which, previously, he was, indeed, able to compass, but only with labour and tribulation.

I shall make no great effort at any so-called explanation of this action of X-rays on osteo-arthritic joints, but will content myself with pointing out three of their well-established therapeutic properties. (1) They are analgesic, (2) they reduce congestion, (3) they have the power of causing the absorption of pathological fibrous tissue.

These osteo-arthritic patients, in contrast to those suffering from the atrophic polyarticular type previously referred to, are usually in good general health, though they may be at times irritable and depressed owing to the local pain and disability. If, however,

the latter can be relieved, they become cheerful and capable of enjoying life. In other words, they are not necessarily suffering from systemic poisoning, as is the case with the rheumatoid patient.

Case 1—Male, aged 62 First seen in January 1931 At that time he could not get out of a chair without assistance, and could walk only a few yards There was history of increasing pain and stiffness for many years Radiographs showed very extensive osteo-arthritic changes in both hip-joints, with apparently complete absorption of the inter-articular cartilages He had a course of treatment by deep X-rays in January, and again in April At the time of writing (July, 1931) he can get out of his chair unaided, walk briskly, even though somewhat awkwardly, and is free from pain, despite walking two or three miles a day

Case 2—Male, aged 69 First seen in March 1931 Had for years suffered much pain in the back, aggravated by walking Radiographs showed extensive lipping of the lumbar vertebræ He has had only three applications of deep X-rays, but the pain is practically gone and he can walk several hundred yards in comfort

There is a third type of case in which the hip is usually affected without any radiographic signs. The movements are limited and painful, but the trouble is confined to the soft tissues The patients are not so badly crippled as the hypertrophic osteo-arthritis cases, but they may suffer even more pain, as they often try to lead a more or less ordinary life It is common in active middle-aged women, and their attempts to carry on despite increasing pain may precipitate a nervous breakdown Dieting, colon lavage, and ordinary physiotherapeutic means will no doubt often relieve such patients, but there is an obstinate residuum in which a course of deep X-rays is necessary to effect a cure

Chronic sciatica is also amenable to X-ray treatment—the applications should be made on the lumbar spine Intercostal neuritis, whether following on herpes or not, and facial neuralgia, may sometimes be cured by X-rays when all other means have failed

X-RAYS IN EXOPHTHALMIC GOITRE

Anyone who will take the trouble to study the literature of the subject of Graves' disease throughout the

surgical cases It is seldom that I have not in my hospital departments an example of recurrence of symptoms after extensive surgical removal.

Case 1—Female, aged 40 years First showed symptoms of exophthalmic goitre in 1919 In the autumn of 1927, when she first came under my care, she said that she felt very ill, and was quite unable to attend to her own housework Between this time and February 1929 she had three courses of X-ray treatment It was then stopped altogether for nine months, as she seemed practically well Since then she has had two short precautionary courses At the present time she feels herself to be in good health, and is able to do her own housework

Case 2—Female, aged 45 years This is a case of recurrence after operation Portions of the gland were removed in 1912 and 1915 After the latter operation she had a period of more than ten years in which she felt well Then symptoms began to return, and she came for X-ray treatment in 1929 While she is not completely cured, she "swears by" the X-ray treatment, which has enabled her to carry on her employment as a teacher

The pathology of the disease does not seem to be any better known than was the case twenty years ago What has long been evident is that simple excess of thyroid secretion does not explain all the symptoms There appears to be a perversion as well as excess of specific hormone. Other ductless glands are upset, and the pancreas often suffers Often there are lesions in the cervical sympathetic, and disturbance of the function of the bone marrow To attack the thyroid by surgery can at best relieve the system of a certain amount of thyroid hormone If the secretion is vitiated it can do nothing to restore its quality On the other hand, the action of properly applied X-rays is regulating rather than destructive The gland remains organically intact, but its output is diminished, without shock and disturbance Possibly the regulation extends to quality as well as quantity—a suggestion which is impossible to make in the case of surgical removal. There is, moreover, in the case of X-ray treatment, the possibility of therapeutic action on the cervical sympathetic When a case of exophthalmic goitre comes under the care of a practitioner for the

first time, I think he would be wise to bear in mind the following points.—

(1) The chances are roughly 50 per cent that the patient can be restored to active life without operation

(2) X-ray treatment does not involve any danger to life. However small the risk, this cannot be said of surgical measures

(3) Three months is a fair trial of X-rays, always provided that although the treatment is stopped at the end of this period, its benefit may not be evident for a long time—perhaps even a year.

(4) The amount of X-ray treatment necessary does not cause any change in the skin, or fibrosis of the gland. Such injuries are due to the former mistaken idea that “pushing the treatment” might succeed, which it never does

(5) As regards permanency of results in the apparently cured, there is nothing to choose between “operation cases” and “X-ray cases”

(6) If the disease recurs after operation, and X-rays have not been employed, they should be tried before further surgical measures are undertaken

(7) As regards the 50 per cent of cases which cannot be clinically cured by X-rays, many will receive much benefit, and may be content with the improvement obtained. But where operation seems advisable it presents no more difficulties than in what may be called from the surgical point of view, virgin cases. I cannot, of course, vouch for it that there are not, even to-day, radiologists who overdose such cases, but I can assert most strongly that a dosage sufficient to cause any organic changes recognizable at operation is unnecessary and harmful

fibrillation (paroxysmal or permanent), nine, paroxysmal tachycardia, one, heart block, one (temporary after coronary thrombosis) Extrasystoles were found in nearly all

SYMPTOMS

In a recent article Halls Dally¹ says that uncomplicated high arterial pressure is usually unaccompanied by symptoms I think that this is true, and one might almost say hyperpiesis has no symptoms—the symptoms are those of its complications That is why so many cases remain undiagnosed till the late stages or to put it another way, that is why the prognosis is so bad—the disease is not diagnosed until complications have arisen

From the general practitioner's point of view the question is, What should lead one to suspect high pressure? for the art of medicine, and especially of general practice, is to divine the probable cause of the trouble and make the appropriate examination, as it is obviously impossible to take the blood pressure of every patient who comes to see us First and foremost is the feel of the pulse, this is contrary to the usual teaching, but although there are unquestionably cases of high blood pressure in whom the radial artery and pulse feel absolutely normal, in the great majority the pulse is hard to compress, and in a fair number the artery is tortuous Secondly, outward displacement of the apex beat should put us on our guard If either of these signs is present, it is essential to take the pressure

The symptoms may be grouped as cardio-vascular (commonest), nervous and excretory

(1) *Cardio-Vascular*—*Pain or discomfort in the left nipple region* It has been suggested that this symptom is generally unassociated with cardio-vascular disease, and certainly we find many cases in which no such lesion can be found But they

naturally call for thorough examination, and in a fair number the blood pressure will be found raised.

A butcher's assistant, aged 47, complained, in April 1929, of pain under the left nipple, which had come on a few days previously, when he was trying to pull a post out of the ground, he had grasped the post to his body, and thought he had strained his heart doing so. I was surprised to find a much hypertrophied heart lifting the ribs, the pressure was 200/130. He is a healthy looking man, with no history of nephritis and no albuminuria, he used to suffer from sick headaches a few years back, but did not consult his doctor. I had treated him for furuncle in 1927, and later for corneal ulcer, without suspecting hyperpiesis. In July 1930 he came to see me with an alveolar abscess, the pressure was 184/120, he has not had the infra-mammary pain lately.

Most patients with high pressure cannot sleep on the left side, this is because the hypertrophied heart moves the chest wall in this position, and keeps them awake. True angina pectoris does occur, but not nearly so often as left infra-mammary pain. One of my patients had coronary thrombosis, from which he recovered, and two died of angina, probably due to this cause; I was not present in either case.

Palpitation Patients generally mean mere consciousness of the heart's action due to forcible beating; it occurs with increased pulse rate in a hypertrophied heart (commonest cause) brought on usually by exertion, it may occur in the normal heart as result of toxins (tobacco and especially coffee) or emotion. Extrasystoles, particularly when they occur at night, the onset of auricular fibrillation and of paroxysmal tachycardia may also cause palpitation. Choking sensation in the throat was the initial symptom in six cases, and I think was due to over-distension of the jugulars, although gross failure was not present.

Dyspnœa This is not as a rule prominent, but is elicited on inquiry. There are two very different kinds that of effort, and that which occurs at night. Nocturnal dyspnœa may be either so-called cardiac asthma, or Cheyne-Stokes breathing; patients do not distinguish between them, both, I think, are excretory

in origin, but the effort type is cardiac.

Tiredness · This is not often a primary complaint, but elicited on questioning. Among the convalescent-home patients, four out of eleven hyperpietics were sent down as suffering from debility following influenza; so we might put as another symptom of high pressure, failure to recuperate in a reasonable time after a feverish illness

Hæmorrhages The common one is nose bleeding. No emergency is more trying to deal with in practice, we know where the bleeding spot is, and nothing is easier to deal with on paper; but at the bedside it is another matter. We check the flow as best we can, being careful to tell the patient it does not matter if it recurs (hoping to avoid a night call) Next day we cauterize the septum, and the case is dismissed. But, if the patient is middle-aged, it is usual to find hyperpietism of a severe order. Of four such cases I saw last year, one woman, aged 65, had B P 255/130, a woman, aged 68, had 268/140; a woman, aged 46, had 194/120, and a woman, aged 68, was found dead five months later, of pontine hæmorrhage; I had not taken her blood pressure

Other hæmorrhages occur. women past the menopause often give a history of floodings I have known hæmoptysis in a man of 60, with B P. 196/110, he was alive seven years later, apparently quite well Hæmatemesis in a man of 55, with B P 206/120, he has had it three times Bleeding from varicose ulcer in a woman of 52, with B P 195/110, a woman of 48, who had B P 250-280/140-160 in 1925, with absolutely no complaints as a rule, suffered from bleeding gums in 1929, she had a stroke in December 1929, and died in 24 hours. Retinal hæmorrhage is sufficiently well known not to require any comment

Acute œdema of the lungs is not common, my experience of venesection in this condition is disappointing, as, although the patient may recover for a time, he is

liable to die of simple heart failure a few weeks later.

Edema of the feet (congestive failure) is a late sign in hyperpiesia, and most cases die without it; when it occurs the patient usually dies in a few weeks

(2) *Nervous.—Headache*. It is a common belief that high blood-pressure patients suffer from headache, but this is by no means always the case. Out of 31 patients selected at random, 13 had headache and 18 had not. Of those who had, 5 had systolic pressures under 200, and 8 over 200; three of them had not suffered at all recently. Of those who had not, 9 had pressures under 200, 7 from 200 to 240, and two over 240. So there is no direct connection between the height of the pressure and the occurrence of headache. Patients sometimes complain of thudding in the head synchronous with the pulse, but as this occurs in the normal subject when vaso-dilators are given, it cannot be due solely to high blood-pressure. Hyperpietics are very intolerant to quinine, and it is liable to give them headache. I have twice brought on headache in women who did not ordinarily have it by giving diuretin; both had pressures over 220, and both eventually died of apoplexy. Sudden fall of pressure may produce headache, this happened in a woman of 55, who had a pressure of 280/160, fearing a stroke, I withdrew 10 ounces of blood, and the pressure fell rapidly to 96/72, and she became more or less unconscious for three hours, the pulse being slow and regular, she then recovered, but complained of severe occipital headache, B P 198/104. Two years later she died of cerebral hæmorrhage.

In 1925 a woman, aged 33, complained of a feeling of oppression in the left nipple region, the B P was 200/110, and the heart hypertrophied, there was a history of scarlatinal nephritis, but no albuminuria. Simple treatment quickly relieved her, and the B P fell to 156/94. In 1926 she had severe and intractable headache, B.P. 170/104, and nothing gave her any relief, three months later she died of a cerebral tumour.

The moral is obvious. we know that cerebral

tumour is liable to raise the blood pressure, so if a hyperpietic complains much of headache we should send her to an ophthalmic surgeon

Giddiness is fairly common, and very difficult to treat, some giddiness or discomfort on stooping is the rule in hyperpietics, but they do not always mention it unless asked

Mental symptoms (cardiac delirium) are usually, but not always, terminal. The patient begins by sleeping badly, and we find the tongue coated, skin dry, bowels constipated and appetite poor. On questioning we generally find there is some disturbance of the respiration at night, such drugs as bromides and chloral have little or no effect; this is very characteristic, and gives good warning of the extremely grave condition which is imminent. The heart is enlarged, apical first sound reduplicated, pulse slow, usually regular or with extra-systoles, but complete arrhythmia may be present, the urine is scanty, high coloured and generally clear on boiling, œdema mostly absent, B P about 180/120. There may be slight pulmonary congestion, but it is not prominent.

The bad nights develop into nocturnal delirium, the patient imagining he is in some other place than his own bedroom, and trying to get back, it is difficult to keep him in bed. At first he is rational during the day, and, unless one is on the look out for it, one may not credit the relations' account. Later the delusions do not remit; in Sir Clifford Allbutt's words, "He is not terrified, but worried and wretched, and if left alone will leap from his bed. Point to the pictures on the wall, and he will say they have been brought there to deceive him." There is no general clouding of the faculties, but an alternation of this delusion with comparative sanity. As time goes on he fails to recognize his nearest and dearest, but may know the doctor. An occupational element may be added to delusions of place. His attempts to get out of bed

become more urgent, until, when he is too weak to rise, he lies askew or across his bed; this usually signifies impending coma and death.

These cases seem to present a failure both of excretion and assimilation. I recently saw such a case recover after irrigating the bowel with potassium permanganate solution several times by Nott's method³

The patient was 71, had auricular fibrillation (no valve lesion) and B P 170/100, the urine measured 20 ounces and contained no albumin. Injections were given daily for three weeks, then less often, they were never retained more than a few minutes, but the output rose to 50 ounces per day, the tongue cleared, and in a month he was quite rational and began to get up. During the summer of 1930 he was absolutely normal mentally, slept without drugs, and went out for walks, but the pulse remained irregular. In November he began sleeping badly again, and drugs were without effect. He had delusions of place on two nights, but he seems to be recovering under the same treatment. The outlook is considerably worse then than in the spring, as the heart is more dilated. The pulse rate has been controlled throughout by digitalis. He died in September 1931 of cerebral thrombosis.

The outlook is not hopeless in these cases so long as the appetite is retained, but when both food and drink are refused the end is near.

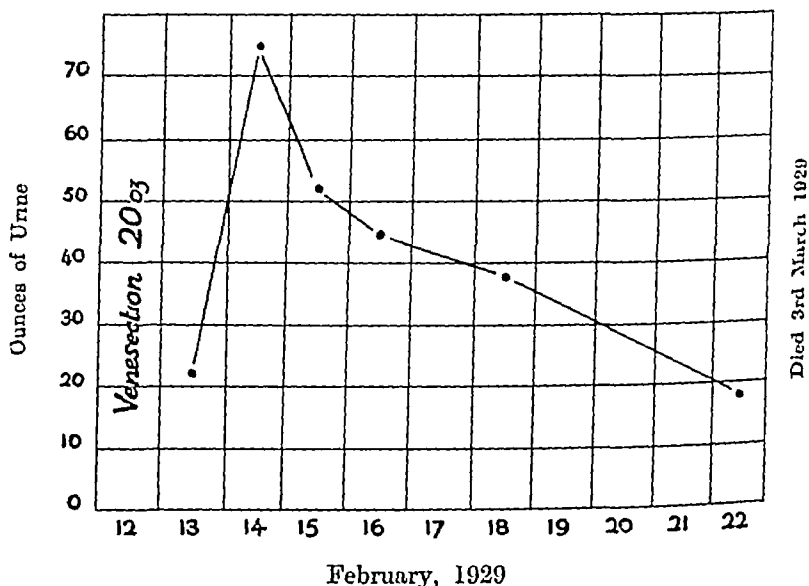
(3) *Excretory*—*Severe vomiting attacks in elderly people*. One sees two or three such cases every year, and they always call for blood-pressure estimation. The patient generally attributes it to dietetic error, fish or tinned foods being the common suspects. The fact that other members of the household are not affected should put us on our guard. The vomiting may be associated with severe headaches, and is always very intractable to ordinary remedies. There is often albuminuria, but it is usually transient.

In 1923 a bricklayer, aged 68, had such an attack, with albuminuria, his B P was 200/130. Last year the pressure was 230/150, he had albuminuria. In 1905 he suddenly went blind in one eye, the retinal appearances suggesting an old hæmorrhage.

In 1925 I was called to see a woman of 48, who complained of feeling giddy, and loss of appetite for several days. I had attended her six months earlier for rubella, but did not suspect anything serious. She was a thin, strong, energetic person, and wanted to spend the next day shopping in London. She went, in spite of my advice, felt very ill all day, and vomited several times in the train.

the next 10 days are shown on Chart 1. Chart 2 shows the output in a man of 73, who was first seen with acute œdema of the lungs, auricular fibrillation, and slight œdema of the feet, his pulmonary condition was relieved by withdrawing 20 ounces of blood, and next day the B P was 190/120, pulse 68, regular except for extra systoles. The œdema of the feet disappeared in four days and did not return, but he developed Cheyne-Stokes' respiration, and died in coma three weeks later.

CHART 2



It might be thought that the diuretic action of venesection is due to the improvement of the circulation by relieving the heart of some of its load, but it is probably less simple than this, as I have known the output rise from 20 to 100 ounces per day after applying leeches over the enlarged liver in a case of mitral stenosis with auricular fibrillation and congestive failure, when digitalis had failed.

References

- ¹ Dally, J. F. Halls. *THE PRACTITIONER*, 1931, cxxvi, 39
- ² Allbutt, Sir Clifford. *Brit Med Journ*, 1924, 1, 1154
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Medical Etiquette

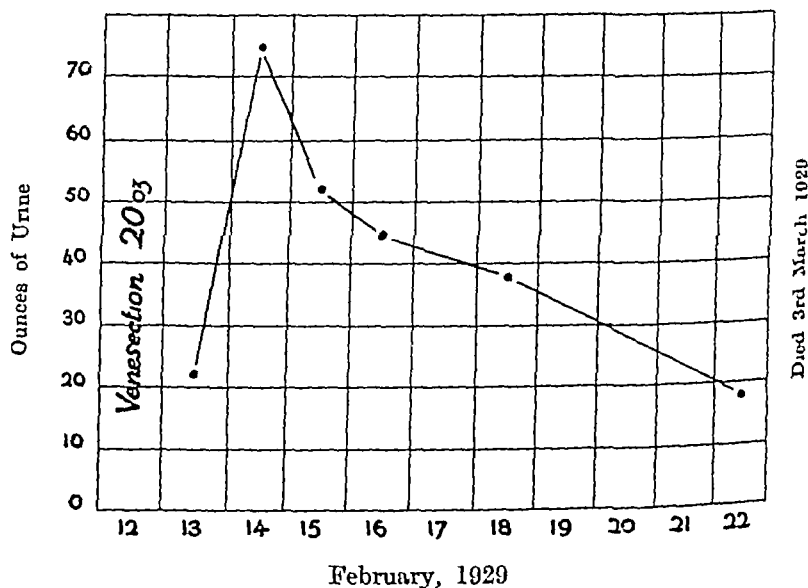
By E A BARTON, M R C S , L R C P

THERE is amongst the public a feeling of ignorance almost akin to awe of the term "medical etiquette," for to them seem so unintelligible the canons of this all-powerful but elusive code. The definition of it is difficult, but one might say that it comprises the recognized courtesy governing the conduct of medical men to one another in their professional relations. Were there no such thing as medical etiquette we should be back in the Dark Ages when every doctor played for his own hand alone, and competition between rivals degenerated into mutual recrimination or noisy depreciation, with the public as scandalized but smiling onlookers. As soon, however, as registration locked the profession into a union, shielded by law against irregular practitioners, the defence of its privileges demanded a code of rigid observances between each member, and though this code is not embodied in any book or rubric, yet the infraction of its rules stamps the perpetrator as a *persona ingrata* amongst his colleagues. Though well defined, and with a very definite object, its canons are so delicate that I propose to consider them under three headings, though these often overlap. (1) Etiquette in relation to one's colleagues, (2) etiquette in relation to consultants, (3) etiquette in relation to general conduct.

Medical etiquette in relation to one's colleagues—When a young doctor puts up his plate in a locality in which he is unknown, his first duty is to call upon his medical neighbours, and this first call should not be long delayed. It shows his ignorance if he waits for other men to call on him and in this we see the reversal of the ordinary social amenities—where a new comer awaits the social call of his or her

the next 10 days are shown on Chart 1. Chart 2 shows the output in a man of 73, who was first seen with acute oedema of the lungs, auricular fibrillation, and slight oedema of the feet, his pulmonary condition was relieved by withdrawing 20 ounces of blood, and next day the B P was 190/120, pulse 68, regular except for extrasystoles. The oedema of the feet disappeared in four days and did not return, but he developed Cheyne-Stokes' respiration, and died in coma three weeks later.

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talk to the consultant when the latter is examining the patient, unless specially addressed, thus the consultant has a better chance of following his own train of thought, for discussion can be continued after the examination has been concluded. It is a great mistake to avoid or refuse consultation in practice, rather should consultation be always courted. There is the patient who is not getting on, who makes but little way, is inclined to fret and become restive under a subacute or chronic disease. By such little signs one senses that he is not satisfied, and before he becomes captious and critical it is time that a second opinion is requested; and such request should come from the doctor rather than from the patient or his friends, for it is always wise to be first in the matter. If, however, one waits till the first move comes from the other side, it seems to be an aspersion on one's knowledge, or a want of confidence in one's treatment, though this is not so usually, but rather is it the outcome of a keen desire on the part of the friends or patient to leave no pebble unturned for the patient's good. If the first move has not been anticipated it is wise that, when suggested, it be accepted with an appearance of relief, as though it were the fear of expense to the patient, or the creation of undue anxiety that had delayed suggestion of such second opinion. As to shirking a consultation or refusing it, the patient's confidence would at once be lost—and very naturally. He would at once conclude that there was a fear of criticism of treatment.

In the letter arranging for such consultation the consultant should not be addressed "Dear Sir," but rather "Dear Dr So-and-so," removing from the first moment any sense of inequality in the forthcoming meeting, and likewise the consultant should address the doctor by name in his reply. More often the doctor is allowed a free hand in his choice, but sometimes a name is suggested of which the doctor is

ignorant, but if the consultant is a qualified man no refusal is possible. He may be the last man in the world one would choose, or even one whom one knows is unsuitable, but, unless there is some very tangible reason for refusal, one's duty is clear. Suppose one refuses to meet him, what then? The patient would claim the right to know one's reasons and an awkward position might arise. Perhaps the relation of an instance may give point to what I mean.

I had not been a year in practice when I was called to see an old man who gradually developed fluid in his pleura. The time had come to do something for him, and I suggested that I should have a second opinion on his case. He did not give me a free hand as to choice of consultant, but suggested that an old medical friend of his should see him with me. I knew the old doctor and I also knew that his opinion would be worthless unless he took the line of paracentesis. I met the consultant, who advised that the pleura should not be interfered with. The patient was getting very dyspnoeic and distressed, and when the consultant had gone I interviewed the friends, pointing out that in the circumstance of his and my disagreement I should like the choice of a third opinion to decide on which course to pursue. Dr Sydney Ringer was called in and I had my aspirator with me. The small operation was performed and the patient made a complete recovery. I wrote a charming letter to the old consultant, who replied in a courtly letter of congratulation. We threw roses to one another and all was a battle of flowers.

Another instance. —

Many years ago a lady came up to town and saw a man who had in his day been a very eminent surgeon, but who for years had retired from hospital from age. After her interview with him she came on to see me and discuss his diagnosis of a very serious abdominal condition requiring operation. The glamour of the old surgeon's name was such that she was anxious that he should perform it. Here was a quandary. I knew the dear fellow would probably kill her if he tried to do it, but it was a thought invidious to criticize his skill. Was it fair to my patient to agree to request him to do it, or was it my duty gently to point out that a younger man would greatly add to her chances of life? I took the latter course and feel sure that two lives were the better for my decision. Had she persisted after my cautious warning all responsibility would have been removed, but I quote this instance to point out how in the choice of consultant one should be guided quite coldly by the nature of the case. There should be no feeling that because So-and-so sends one patients one should return the compliment, unless assured that he was the best man for an expert opinion.

The etiquette with regard to the treatment by a consultant of a patient in the absence of the ordinary

medical attendant is very thorny, and often has to be treated on its merits. Should a consultant agree to see a patient without the doctor? Under certain conditions I feel sure that the answer is "Yes," and these conditions are: (a) That the consultant cannot extract from the patient the name of the medical attendant, (b) that the patient has no medical attendant; (c) that the patient has dismissed the medical attendant, (d) that the patient's doctor is aware of the consultation

In no circumstances should a consultant alone attend a patient already in the care of a general practitioner at his, the patient's, house. If the consultant can extract from the patient the name of the doctor usually employed, it is the consultant's duty to notify him and enclose a *résumé* of the opinion and desirable treatment. But so often the patient either refuses his doctor's name or he denies that he has any medical attendant, in which case the consultant is cleared of any further obligation. Now the consultant is often misled, and always hampered by the absence of the doctor in attendance, and not only does the patient suffer thereby, but the same instinct which makes the patient run after another opinion often prevents the patient from telling the whole truth about his case, occasionally even going so far as wilfully to mislead. Sometimes a patient will go the round of a number of specialists until he gets the opinion which coincides with his wishes, as one who, wavering between duty and desire, tosses a coin to decide the matter—and the verdict being against his wishes goes on tossing till he obtains a decision in accordance with his inclinations. The patient is quite unable to assess the value of his symptoms, and in his consultation often fails to mention, or slurs over, the pivotal fact round which the whole condition turns. It may be a matter of which he is ashamed, or a family failing which he omits to mention; so that such consultations are oft-times

barren and generally to be deprecated on principle. The sufferer may, or may not, inform his medical attendant, and should such attendant learn of the consultation he should never show the least annoyance, but rather an interested amusement, for if he is sure of his treatment the consultation usually confirms it. An instance from the writer's notes —

There was, some years ago—he is dead now—a physician who saw nothing but duodenal ulcer in every stomach ache. He reduced the whole of his medical universe to terms of duodenal ulcer, as some do to intestinal kinks, pyorrhoea, vitamins, and what not. His nursing home was filled with “duodenal ulcer” cases in various stages of treatment. Now there came under my care a man of highly neurotic temperament with a family history of mental instability. He suffered, as he pantomimically expressed it, “the agonies of the damned,” in his belly. His appetite was excellent, he snored, so his wife told me, without turning, eight hours every night, but he suffered intensely. I found no fault with him physically, but “when a man is so ill as to think that he is ill when he is not ill, then is he very ill.” After I had seen nothing of him for some months he turned up one day saying he had a confession to make. I held up two fingers in absolution and told him his sins were forgiven him before he spoke. Then he told me he had been to see Dr. X.

“When do you go into his nursing home?” I asked.

“Oh, then you have heard from him?”

“No.”

“Then how do you know?”

“If you go to Dr. X you have duodenal ulcer.”

“That is exactly what he said, and also that unless I went into his home and did what he told me I might have need of operative interference.”

“Yes, and when do you propose to put yourself under his care?”

“In a few days when I have settled up my affairs.”

Then I spoke to him plainly, went round to see his wife, and in the end dissuaded him from making a fool of himself. That was fifteen years ago. He has the same pains, but eats and drinks everything, sleeps like the dead, and enjoys life unless someone enquires after his health. Had I been present at the consultation I should have unfolded a tale that might have shaken, though I much doubt it, even the confidence of Dr. X in his diagnosis.

With regard to the fee of the consultant, it is an understood condition that the general practitioner should see that it is paid, and this should be done at the time of the consultation, but there is no guarantee of such fee by the general practitioner. In the case of operation the amount and arrangement of fees should

be definitely and explicitly settled beforehand, but with the exception of the anæsthetist, who should be paid at the time, the surgeon should receive his fee at the last attendance of the after-treatment

Etiquette in relation to general conduct—Under the third heading is comprised some small points not included in either of the previous two. The first perhaps concerns our view of another practitioner as seen through the story of the patient. It is wise to accept with the utmost caution any account of the treatment or opinion of a colleague as related by the patient. Marvellous is it how men and women, in all other respects the soul of truth and honour, side-slip quite unwittingly when they attempt to give an account as to what some other doctor has told them. Sometimes a patient tries to curry favour or create a laudatory atmosphere by the detraction of his previous medical attendant, and here one's hackles should rise in preparation for his defence. The treatment may sound absurd, but one must have more than the verbal evidence of a patient before adversely criticizing it even to oneself. A perverted account of what is said by one will surely get round to the other doctor, and bad blood may ensue.

There is one more point worth consideration, namely, breach of confidence. The public trust us absolutely. They trust us not with their money or their faith, but with their lives, and certificates signed by us bear a title that others envy, for as in the sick room a doctor's word is law, so is his signature the guarantee of absolute truth outside it. It is wise to destroy letters, and to guard one's notes against all eyes. Even the ideal wife learns that there is a fence in her husband's life beyond which she may not trespass. No word spoken in one's room should go out of it. Quite recently there was ushered into my room a young lady announced as "Miss Smith." She began her tale with the preface that her name was not Smith, and requested that should I meet her in the street I should ignore her,

adding : " You see, if I tell our old doctor, dear Mamma will hear all about it, but I know that you are discreet in all that goes on here " I liked that compliment. But the best compliment that one can receive is the request of a colleague to attend either himself or his household A compliment from a patient is of no value ; from a brother practitioner it is quite another matter, and no fee should ever be taken from the household of a doctor in active practice The reward lies in the confidence of one qualified to assess one's skill, and also in the fact that when sickness comes to one's home a like kindness will be extended. The case is different, however, when the grown-up children of a doctor earning their own income require attendance, or the very exceptional case of a doctor's widow in affluent circumstances

Lastly, no present either of cash or kind should be taken from a sick patient without the knowledge and complete acquiescence of the relatives, for the patient when very ill is often not quite *compos mentis*, and may do things in a moment of gratitude which later either he or his relatives might regret.

Perhaps from some aspects it may appear that the safeguarding the professional fee is the foundation on which all this etiquette is founded, but on close examination it will be apparent that in reality the prime factor is the ultimate benefit of the patient ; and as such rules of medical etiquette are handed down to us by our forbears, let us look to it that we pass them on untarnished.

Practical Notes

The Etiology of Rheumatoid Arthritis.

R L Cecil, E E Nicholls and W J Stainsby consider that the present position of rheumatoid arthritis with the several hypotheses about its etiology is not unlike that which existed with regard to tuberculosis before Robert Koch isolated the tubercle bacillus. Rheumatoid arthritis has been thought to be due to hereditary influences, to exposure to cold and wet, neurotrophic disorder (Weir Mitchell), disturbed carbohydrate metabolism (Pemberton), intestinal putrefaction (Arbuthnot Lane), and infection. After several years of research the authors believe that it is a chronic infection caused in the great majority of cases by a specific streptococcus on the following grounds: the almost constant presence of streptococci in foci of infection, streptococci recoverable from the blood in 82.3 per cent of 154 rheumatoid patients, in 3.9 per cent of 61 patients suffering from other diseases, including infections, and not in any of 20 healthy controls, streptococci recoverable from the affected joints in 87.3 per cent of rheumatoid patients, but none from non-rheumatoid joints, high agglutination of "typical strains" of streptococci with the blood-serum of rheumatoid subjects, disappearance of agglutinins with recovery from the symptoms of arthritis, biological identity of streptococci recovered from the blood, joint, and focus of infection in the same patient, though there have been a number of exceptions to this rule, production of rheumatoid arthritis in rabbits with "typical strains" of streptococci, recovery of the same organism from the blood and joints of arthritic rabbits, and the striking resemblance of the microscopical changes in the experimentally produced changes in the joints of rabbits to those in human rheumatoid joints.—(*American Journal of Medical Sciences*, 1931, clxxxi, 12)

Tennis Elbow and Allied Conditions

Conzette discusses the condition of tennis elbow, which also incapacitates fencers and is analogous to a similar pain near other joints, such as the wrist and knee. On palpation there is nothing to be felt and X-ray examination is negative. There is pain of a very localized character, so much so that the area can be covered by the last phalanx of the index finger, and is most often to the inner side of the humerus and due to epicondylitis, but the pain may be caused by changes connected with the epitrochlea. The author ascribes the pain to the pull of the muscles on the periosteum, a view in which he was anticipated by the late C T Dent in his article on "Periostitis following muscular exertion," in 1897 in *THE PRACTITIONER*. The disability lasts for weeks, months, or even years, with intervals of latency when the arm is kept at rest. It chiefly occurs in adults and especially in muscular athletes. The author prefers as the title apophyseal periostalgia, because epicondylitis is a generic term for all bony lesions in connection with the apophyses, such as

tuberculosis, syphilis, and Schlatter's disease —(*Presse médicale*, Paris, 1931, August 5, 1167)

Rheumatic States and their Treatment

G Zacharial gives the following classification of the conditions which may be truly termed "rheumatic," excluding cardiac complications (1) Inflammatory conditions of muscles, including "Myalgia" (2) Rheumatic affection of nerves, especially the neuralgias, and sciatica (3) Acute rheumatic joint lesions (4) Chronic diseases of joints, which comprise chronic secondary infective polyarthritis, chronic primary arthritis, endocrine polyarthritis and arthritis deformans For all these conditions he contends that the primary and essential feature of the treatment should be hot brine baths, preferably sulphurous, at a temperature of 103°F The chemical dissociation of the salts which occurs allows the free ions to come into contact with the skin and penetrate it After the baths it is essential that the affected parts should be covered with anti-phlogistine, and on the days when baths are not given the joints must be rested and well supported. There is a definite lowering of blood sugar after the baths, and the blood pressure also falls in consequence of an excretion of histamine bodies by the skin Precautions must therefore be taken against collapse As accessory measures large quantities of a sulphurous mineral water are given the patient to drink daily, and intravenous injections of sodium salicylate or trypaflarine may be tried Zacharial publishes his results with cases treated in this way Of the many statistics given the most interesting are those of 124 cases of chronic infective polyarthritis, 79 per cent of which were cured —(*Medizinische Welt*, September 26, 1931, 1396)

The Early Diagnosis of Rheumatic Heart Disease in Children

M Seham, M. J Shapiro and E H Hilbert state that one child may suffer from decompensation of the heart from a first attack of rheumatism while in bed and another may have repeated attacks of rheumatism and escape involvement of the heart In one case definite signs and symptoms of organic heart disease may become apparent in a very short time, while in another it may be one or two years after the first attack of acute endocarditis before the heart has undergone sufficient progressive changes to warrant the diagnosis of organic heart disease Of 809 patients admitted to hospital during a period of seven years, 46 per cent of the cases were diagnosed as organic heart disease and 54 per cent as "no heart disease" Of 379 cases of organic heart disease, 18 per cent were congenital lesions of the heart, 74 per cent were rheumatic in origin, only 3.6 per cent were due to other causes, and 4.4 per cent were undiagnosed The problem of differential diagnosis revolves chiefly around the children who present the following conditions (1) a systolic murmur, with or without circulatory signs and symptoms, (2) rheumatism and a systolic murmur that has escaped carditis, (3) rheumatism and a systolic murmur that ultimately develops into chronic endocarditis, and (4) congenital heart disease, especially patency According to

the authors' statistics, the most reliable means of diagnosis is the history. A questionnaire gives more positive data than informal questioning. In 92 per cent of the cases of early mitral disease the authors were able to obtain a history of rheumatism according to the definition that they have used. Rheumatism alone causes 39.3 per cent of rheumatic heart disease, rheumatism in combination with other causes, 83.1 per cent. Growing pains alone are responsible for 2.3 per cent. The so called functional heart tests are of no value in determining the myocardial sufficiency of the heart — (*American Journal of Diseases of Children*, September, 1931, 31, 503)

The Pains in Arthritis.

Under the title "*Rheumatism that requires Morphine*," E. H. Rynearson and P. S. Henck, after remarking that the pains in the well-defined forms of rheumatic disease may be very slight or distressingly severe, ranging from "the agonizing paroxysms of acute gout to the latent soreness of a Heberden's node," definitely state that morphine or its equivalent is practically never necessary for the relief of pain in the usual forms of chronic joint disease, such as gout, infective or traumatic arthritis, and that pain sufficiently severe to require morphine in what is regarded as chronic arthritis should suggest another diagnosis and a thorough review of the case. Examples are given of cases admitted with a diagnosis of "rheumatism" or "arthritis," which aptly show that a possible malignant growth should be suspected in stubborn rheumatic elderly men, three men about 60 years of age, who for years had complained of mild pains in the back, suddenly had pain of a different character requiring morphine, they all had malignant metastases in the spine. In acute arthritis, especially that of gout, morphine may, though rarely, be required, but it should be given in the acute stage only — (*Proceedings of the Staff Meetings of the Mayo Clinic*, 1931, July 22, vi, 434)

The Treatment of Rheumatic Arthritis by Protein Shock

F. Wehsarg recommends the treatment of rheumatic joint disease by protein shock in those patients in whom the cardiac condition does not permit of balneotherapy. The preparation he uses is a combination of a protein base with 16 per cent of sodium salicylate, which has been given the name of "*Spiroprotasin*." This is injected intramuscularly in doses of 3-5 c cm and may be given daily. Pain diminishes rapidly after injection, and good success even in the case of advanced arthritis is recorded. It is recommended that these injections might be given as a preliminary to a course of baths in severe cases of muscular rheumatism or polyarthritis rheumatica — (*Münchener medizinische Wochenschrift*, July 3, 1931, 1134)

The Value of Prophylactic Gynæcology.

A. F. Lash suggests that prophylactic gynæcology, practised at the end of the usual involution period, prevents the occurrence of

in this office, Professors C Lovatt Evans and A V Hill, pay a graceful tribute. The revisers of the present edition have largely rewritten it, but point out that most of the conclusions reached by Professor Bambridge in 1918, based on the data then available, still hold good, and that the original form of the book has been retained. It is interesting to note that dilatation of the heart during exercise is a strictly physiological process, because, by increasing its contractile power in accordance with the law of the heart, it enables the heart to increase its output per beat in response to a larger venous inflow. During exercise the flow of blood through the active muscles may be from six to nine times greater than during rest. In the chapter on training the diet is considered and the value of jam and sugar to an athlete pointed out, but provided it is ample and properly digested the food is of subsidiary importance to regular and progressive exercise. Formerly the problem of the "athletic heart" was perennial, now it is unanimously agreed that it does not exist, and there is not any convincing evidence that young athletes, properly supervised and free from any cardiac lesion, are likely to damage their hearts, but sporadic and severe exercise in men over 40 years of age may do more harm than good.

The Pathology of Internal Diseases By WILLIAM BOYD, M D, M R C P E. Professor of Pathology in the University of Manitoba. London. Henry Kimpton, 1931. Pp xvi and 888. Illustrations 298. Price 45s.

THIS companion to the author's work on "Surgical Pathology" is an excellent one and admirably illustrated. Starting with the sound basis of structural changes, these are correlated with clinical manifestations in a thoroughly practical manner. The text is well up to date, and, though the opinions of authorities are properly acknowledged, it is not overburdened with references which are collected at the end of each chapter. The volume is necessarily large to cover efficiently the very extensive subject, but the contents are well proportioned and clearly presented.

Practical Morbid Histology. A Handbook for the Use of Students and Practitioners By ROBERT DONALDSON, M A, M D. 2nd edition. London. William Heinemann (Medical Books), Ltd., 1931. Pp ix and 487. Illustrations 214. Price 42s.

As compared with its original edition in 1923 this useful handbook has now undergone very considerable changes, previously without any illustrations, it now has one to rather more than every three pages of text, and the shape of the volume has been much increased. Thorough revision of the text has enabled new chapters to be added without unduly increasing its size. This clearly written book with its beautifully executed illustrations admirably correlates the naked-eye and the histological changes in the body, so that the student passes directly from one to the other. After a chapter on inflammation, organization, and repair the morbid changes in the various organs are systematically considered, and, finally, two appendices deal with the formulae for stains and parasite worms.

respectively Professor Donaldson may be confidently congratulated on the success of this second edition

Recent Advances in Haematology By A. PINEY, M.D., M.R.C.P.
3rd edition. The Recent Advances Series London J and A Churchill, 1931 Pp x and 348 4 coloured plates and 18 text figures Price 12s 6d

THIS stimulating work on the morbid conditions of the blood and blood-forming organs which originally appeared in 1927, has now passed into a third edition, and in the meanwhile has been translated into Spanish. This success is thoroughly well deserved, for the text teems with new facts and observations, the author's acquaintance with the literature is most extensive, and the illustrations are unusually effective. The present edition contains two new chapters, one on some anæmias with a low colour index, which deals with several different forms of anæmia, and the other on the sickle-cell anæmia which has been almost entirely found in negroes, among whom it occurs in America in about 6 per cent of those otherwise normal. Numerous other additions have been made, especially in connection with the liver treatment of pernicious anæmia, for example, Huth's observation that adrenal cortex and histamine are as effective as liver extract.

Demonstrations of Physical Signs in Clinical Surgery By HAMILTON BAILEY, F.R.C.S. 3rd edition Bristol John Wright and Sons, Ltd., 1931 Pp 277 Illustrations 318 Price 21s

THE third edition of this very practical handbook has been revised and enlarged. Additional signs, and a chapter on gangrene, have been incorporated, and we observe a number of new illustrations. The work maintains its high standard and the additional matter does not appreciably increase its size. After reading it from cover to cover, we are still of the opinion that it is the best of the smaller books on clinical surgery, invaluable to both student and teacher. Brevity, simplicity and a profusion of admirable illustrations remain its distinctive and most attractive features.

Diseases of Women By THOS. G. STEVENS, M.D., B.S., F.R.C.S., M.R.C.P. 3rd edition London University of London Press, 1931 Pp 444 Illustrations 202 Price 20s

WHEN a textbook reaches its third edition, it necessarily means that it is well above the ordinary production, and is one of the small select band which successive generations of students have taken to their hearts. To write a clear account of diseases of women is difficult. In many sections, most divergent views have been expressed by various authorities, and to state these views in a simple understandable way, so that the student can grasp the subject and satisfy these various authorities when met across the examination table, require an author with a large knowledge of the literature, a wide clinical experience, a sane and well-balanced mind, and above all a profound knowledge of general as well as special pathology, as many of these divergent views are due to the fact that the authorities do not trouble to make their statements

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The Scope and Limitations of Endocrine Therapy

By SWALE VINCENT, LL.D., D.Sc., M.D.

*Late Professor of Physiology at the Universities of London and
Manitoba*

IN previous communications on this subject^{1, 2, 3, 4, 5} I have criticized the wholesale and indiscriminate employment of preparations made from various organs and tissues of the animal body. It has been pointed out that in cases in which no definite physiological action can be ascribed to extracts of organs (e.g. lymphatic glands) the clinical evidence of their value must be very strong if it is to be seriously considered. Purely empirical results are by no means to be despised, if we can be sure that the beneficial result is real and not imaginary, and that it is due to the treatment and not independent of it. In these days of accurate clinical tests there is not so much excuse as there was formerly for trusting implicitly to the patients' declaration that they "feel better."

The chief matter under dispute has been the value of certain endocrine substances *when given by the mouth*, and on the present occasion most attention will be paid to this point. My own attitude has been that none of the preparations on the market (except those from the thyroid) has been shown to produce any appreciable effects—beneficial or otherwise—when

taken into the stomach.

It must, however, be admitted that a spirit of healthy doubt is growing among medical practitioners I find, in looking up recent reports of cases treated by "clinical endocrinologists," that there is a marked tendency towards a more scientific method. A great deal of attention has been paid in the last year or two to extracts made from ovary and pituitary. In the majority of the papers I have seen, the material, it is stated, has been injected beneath the skin or into a vein and not given by the mouth. In some of these reports the authors affirm specifically that the extracts are of no value if taken into the stomach.

But there is still an enormous amount of uncritical prescribing of endocrine products. The lists of preparations of animal origin contain such things as extract of brain, duodenum, lymph node, mammary gland, testis, ovary, parathyroid, pineal, placenta, prostate, kidney, spleen, and thymus. They contain also several combinations of two or more of these, such as "ovo-testis," "ovo-thyroid," "mam-ovary," "mam-placenta," "multi-gland," and the like. It is, however, surprising how few properly reported cases dealing with the above substances have been published in recent years.

It may be noted that these various preparations for oral medication are usually made by simply drying the organs or tissues, and no attempt is made to extract the specific active principle, if there is one. They are made up in tablets or capsules and the patient is told to swallow them three times a day.

Let us examine the claims of some of these preparations. Is there any evidence that dried brain, mucous membrane of duodenum, lymphatic gland, mammary gland, testis, parathyroid, thymus, and others, produce any effects of any kind when given by the mouth? There are a few scattered reports of benefit from such administration, but for the most part they are not

worth the paper they are printed on. Many of the above have not been shown to contain any specific active principle, and, in the case of some others, notably duodenum and parathyroid, the active substance, to be of any use, must be extracted in a special way and administered in some other manner than by the mouth.

Liver extract appears to be in a special category. There is now considerable evidence that it is of great benefit, orally administered, in pernicious anæmia. According to some authors, the mucous membrane of the stomach likewise contains a principle which is valuable in the treatment of the same disease. It is not clear how these act and it is doubtful if they should be reckoned among the endocrine drugs.

In a certain list of "special formulæ" advice is given to the practitioner as to the indications for the use of each preparation. The first two are for the treatment of "hypoadrenia, asthenia, low blood-pressure, fatigue syndrome," and contains thyroid, pituitary and adrenal substance, one containing testis, and a second containing ovary, as the first is intended for males, the second for females. Other preparations ("pineal comp") contain thyroid, anterior pituitary, adrenal, and the mixture for boys contains testis, while that for girls has ovary instead. These are recommended for "backward children, mongolism, retarded mental or physical development." The effect on mental development is postulated we may suppose, from Descartes' hypothesis that the pineal body is the seat of the soul. Then we have a "thymus comp" containing thymus, thyroid and pituitary prescribed for chronic arthritis, rheumatoid arthritis, and arthritis deformans. Another is the "renal-pancreas comp." containing kidney and pancreas, to be given in nephritis and for the "prevention of uræmia."

Observe that the great majority of these products which contain more than one kind of substance include

thyroid material It is difficult to be certain of the psychological reason which induces the manufacturers to employ thyroid so frequently. It is, of course, the only ingredient in the majority of cases which can possibly be expected to give any definite pharmacodynamical results Is this frequent inclusion of thyroid an expression of a not-to-be-suppressed feeling of fair play, a guarantee that the patients shall at any rate get something for their money, or is it a provision against criticism to the effect that the preparations are totally inactive?

Apart from the question of the actual effects of the various ingredients, there is another very serious objection to giving several drugs in combination in a branch of therapeutics which is confessedly experimental If any results, good or evil, should accrue from the administration of a mixture, how is one to know which of the components is responsible? This, of course, is only a special case of the commonest error in everyday medical practice The doctor alters all or several of the conditions surrounding a patient. climate, diet, rest or exercise, and gives a drug, and, if there is any change in the patient's condition, arbitrarily ascribes this to one of the factors only, viz. the drug.

It would be waste of time and waste of paper to discuss clinical reports of alleged benefits from the administration of extracts of lymph glands, prostate, kidney, testis, and so forth, but it may be worth while to refer to some records of oral treatment by pituitary and ovarian substance. Rowe and Lawrence⁶ describe the case of a girl seventeen years old who had never menstruated "The delayed menarche [onset of menstruation], absence of breast development and body hair, the small uterus and the patient's body configuration are typical of hypophyseal infantilism" The girl was accordingly treated with pituitary extract, anterior lobe. The date of admission and the beginning

of treatment is not stated, but on January 15, 1925, "the breasts had developed a little and there was a slight growth of axillary and pubic hair" On June 24, 1926, menstruation began—more than eighteen months after the beginning of treatment¹ It appears that not until December, 1927, was regular menstruation established, and in the meantime the condition of the tonsils had made it necessary to remove them. I submit that this case does not furnish any evidence whatever of the value of pituitary treatment. There is no reason to doubt that the sexual development would have occurred in any case. Such delayed development is not uncommon. The authors mention that a paternal aunt of the patient did not menstruate till after her sixteenth birthday, and there is no record that, when she did so, it was the result of pituitary treatment. It is also to be noted that the effect of removal of the tonsils is fully admitted.

To another case recorded in the same communication⁷ the authors append the following interesting note: "If a diagnosis of pituitary tumour on the radiographic findings of the sella is ever justifiable, the picture presented in this patient would seem to be an ample warrant. The laboratory examination, however, was wholly negative, and, *more significantly, the result of treatment would seem to indicate a purely non-endocrine cause of the patient's difficulty*"* Such faith have the authors in mouth treatment by pituitary that they employ it as an ancillary method of diagnosis. It would appear from the history that the good result of treatment of infected sinuses was a surer proof that there was no pituitary tumour.

Rowe and Lawrence state that in ordinary doses no effect could be demonstrated from pituitary extract in the majority of their patients, but doses of from one to two grams (15–30 grains)[†] produced demonstrable

* The italics are mine —S. V.

† The particular preparation is not mentioned.

results in a large number of cases. They refer to the work of Menninger,⁸ who states that in certain individuals adrenaline is effective given orally, and suggest that this "reopens the whole question as to the effectiveness of endocrine preparations thus administered" It may be, these authors suppose, that variations in the gastric secretion of individual patients account for the variations in the effect of the preparation administered.

Turning now to the results of treatment by ovarian preparations, it must be admitted that a slight modification of the views set forth in my previous papers has become necessary. Newer and more powerful extracts have been prepared and put upon the market, and these if given in very large doses by the mouth have been shown to give rise to definite physiological effects. Hannan,⁹ working in my laboratory, found that the œstrus-producing autacoid is active if administered by the oral route in very large doses *The dose required is some sixty times larger than that which is necessary when the autacoid is administered by injection* It is probable that in the majority of cases the doses administered by the mouth to human beings have been totally inadequate, especially when the crude dried ovarian substance has been employed Hannan worked with oophorectomized albino rats, and, for the quantitative experiments used the experimental substance "estrogen," placed at his disposal by Messrs. Parke, Davis & Co It is worth noting that "estrogen" is obtained from the placenta and not from the ovary.

The results obtained by practitioners who have treated patients with ovarian preparations given by the mouth seem to have been very doubtful. In some cases it is reported that the patients responded favourably, in others no effect was produced. It seems to be admitted that many ovarian preparations are inert Hannan found, on taking samples of the batches of ampoules supplied for his work, that some were totally

ineffective The irregularity in the activity also occurred in specimens of the autacoid prepared by himself, and was found to occur in all samples of commercial products which he tested It seems to be the case that, if any good is to be expected from giving ovarian preparations by the mouth, much larger doses than is usual must be employed, and that concentrated forms of the extracted autacoid should be used and not the crude ovarian substance. Even in this case the possibility that the particular material used may be inert must not be overlooked

Dried adrenal substance is one of the principal therapeutic agents employed by the clinical endocrinologist There are, however, few critical or exact studies of the results obtained by its oral administration The suspicion that such preparations are worthless when given by the mouth was aroused in the present writer many years ago, when it was found to be impossible to observe any physiological effects upon dogs, cats and rabbits when they were fed with the adrenal bodies of the sheep, and the administration of large doses of extracts (in some cases made from medulla only) failed to produce any noticeable rise of blood pressure in the human subject At that time, however, the effect of extracts of medulla on blood pressure was the chief if not the only consideration. There was scarcely a suspicion that the cortex is morphologically the true adrenal body and the part which is essential to life It has recently been found by Hoskins and Sleeper¹⁰ that dried adrenal substance administered in large doses by the mouth in nine male schizophrenic human subjects gave entirely negative results

Hartman and his co-workers¹¹ have reported that a patient with Addison's disease has been kept alive by treatment with extract of the adrenal cortex But this was given into a vein If the cortex and the medulla of the adrenal body have any functional

relationship with each other—if, in fact, they constitute a single gland, as some workers insist—then it would appear reasonable to administer adrenaline as well as cortical extract in cases of Addison's disease.

Feeding rats with mammary gland (in doses corresponding to 4 oz. of desiccated material daily in the human subject) produces no effect on the oestrous cycle, and the theory of the existence of a mammary autacoid appears to be without foundation (Charlton and Lee¹²).

The question of parathyroid therapy by the mouth, is, it must be supposed, still under discussion, and its aspects naturally change with the discovery of fresh methods for obtaining active extracts. Extravagant claims have been made by some authors for the value of parathyroid substance in all sorts of diseases. Those cases are most worthy of consideration which deal with the treatment of disorders known to be due to parathyroid deficiency. Even when the parathyroid material is given otherwise than by the mouth the reported results do not always carry conviction. Thus Lissner and Shephardson¹³ have reported the successful treatment of tetania parathyreopriva by Collip's parathyroid extract given intramuscularly. The case is not very convincing. I have found¹⁴ in monkeys that tetany (occurring after even four parathyroids had been removed) is sometimes transient, and the animal completely recovers. Surely spontaneous recovery might easily have occurred in the case of Lissner and Shephardson, especially as they appear to have left one parathyroid behind.

Again, in parathyroid therapy the issue is confused in many instances by giving calcium salts at the same time. With the pharmacology of calcium we are not concerned in this place.

Many authors have reported good effects in anæmia when extracts of spleen and bone marrow are administered by the mouth. The results, however, do not appear to be in any degree comparable to those obtained

by liver in pernicious anæmia

SUMMARY

The cases in which it is possible to employ a true endocrine therapy—artificially to take the place of the internal secretion of a gland—are those of the thyroid, parathyroid, pancreas (insulin) ovary, adrenal cortex, adrenal medulla, and the two parts of the pituitary. *Of these only one, the thyroid, is known to produce any effects when given by the mouth* * The others must be administered by some other route I have included the chromaphule tissue ("medulla of the adrenal" in mammals) and the two parts of the pituitary in order to be on the safe side But adrenaline and preparations of posterior pituitary are chiefly used as drugs apart altogether from the question of internal secretion and substitution therapy. The anterior lobe of the pituitary, though it produces marked effects on growth when injected into animals, has not yet been shown to be of service in the treatment of disease in the human subject Extract of liver, given by the mouth, has been found to be valuable in the treatment of pernicious anæmia

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* Except, in the case of the ovary, when given in enormous doses (*vide supra* p 610)

Recent Observations on the Pituitary Body

By W. LANGDON BROWN, M.A., M.D., F.R.C.P.

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THE pituitary is the leader in the endocrine orchestra. Very little was known of the endocrines until the last decade of the nineteenth century, and although Rathke¹ had pointed out the double origin of the pituitary, from the brain and from an invagination of the mucous membrane of the alimentary tract, as long ago as 1838, it was not until 1895 that George Oliver and Schafer² gave the first suggestion as to the function of the gland by extracting an active physiological substance from it. In the previous year³ the same observers had prepared an active adrenal extract. According to Swale Vincent,⁴ Pisenti and Viola in 1890 were the first to employ experimental opotherapy with the thyroid glands. But it was G. R. Murray's⁵ successful use of a glycerine extract of sheep's thyroid in 1891, which excited general attention to the subject, and initiated hopes of a rational system of organotherapy. Many difficulties, however, have been encountered on the way which were not anticipated at the start.

It is worth while to recall these facts in order to remind ourselves how recent a subject is the whole of endocrinology. Thirty-seven years ago no one had any evidence as to the function of the pituitary. But where knowledge is lacking, speculation is rife and the most recent work has tended to show what inspired guesses our predecessors made on the subject. The anatomists of the past, looking at the brain enclosed in bone, and joined by a narrow stalk to this small body also thus enclosed, like a brain in miniature, were struck with the idea of a little shrunken brain, which,

as it were, responded to, or repeated, the actions of the big brain above. Modern research has shown that there is more in this idea than was supposed in the nineteenth century. Harvey Cushing, to whom more than any other one man our knowledge of the pituitary is due, gave a brilliant review in his Lister Memorial Lecture⁶ of the relationship between this gland and the nervous structures or diencephalon lying immediately above it; he re-echoed the saying of Radley in 1695 that "it seems in a manner almost impossible to treat of one independently of the other." The following quotations from his lecture may well serve as a text for this paper:—

"No other single structure of the body is so doubly protected, so centrally placed, so well hidden [as the pituitary] Here in this well concealed spot, almost to be covered by a thumb-nail, lies the very mainspring of primitive existence—vegetative, emotional and reproductive—on which with more or less success, man, chiefly, has come to superimpose a cortex of inhibitions. The symptoms arising from disturbance of this ancestral apparatus are beginning to stand out in their true significance. The diencephalon is an ancient part of the brain which remains essentially unaltered in all creatures that have a brain at all. Moreover, it proves to have direct connections with the first of the organs of internal secretion to become recognisably differentiated, and on which the very perpetuation of the species depends. Such primitive instincts as hunger, thirst and sleep also seem to be mediated through this region. Cyclicalism, which may be diurnal, lunar or seasonal is a peculiarity of many physiological processes, such as oestrus, menstruation, hibernation and indeed ordinary sleep. That these processes are somehow under the control of the diencephalo-pituitary apparatus seems most probable. Recent investigations serve closely to relate the diencephalon to metabolic processes, to the primary emotions and lastly to the sympathetic nervous system."

Let us deal with each portion of those structures in turn. It has been known for a good many years that the *anterior lobe* of the pituitary contains both eosinophile and basophile cells; it had also been recognized clinically that this lobe is concerned with both growth and sexual development. P. E. Smith⁷ was able to supplement such observations experimentally on rats. Removing the pituitary from one of two litter-mate brothers, he found that three mont

later this animal was dwarfed and sexually infantile compared with its brother. He then had a pituitary transplanted into it each day. In another three months it had almost caught up its brother in growth and sexual development.

Simmonds⁸ of Hamburg pointed out the frequency with which the pituitary may be affected by embolic processes in the course of septic infections. The symptoms naturally vary with the age of onset. His first series of cases had chiefly occurred in consequence of puerperal sepsis. In one instance the patient's premature senility, somnolence and death were found to be associated with almost complete cicatricial destruction of this gland. The viscera were atrophic, in sharp contrast with their enlargement in acromegaly. If such an infarct occurs in childhood and involves only the anterior lobe, the results are even more striking; the patient may show an extraordinary premature senility, as first described by Jonathan Hutchinson⁹ and subsequently more fully by Hastings Gilford¹⁰ under the name of "progeria", signifying premature old age. The "enfeebled old dotard of five" of the "Bab Ballads" is an example of this. Similar cases have shown a failure of the adrenal cortex to develop, and the condition has been referred to this failure. But it would appear equally liable to result from damage to the anterior pituitary, either by a vascular lesion or by a tumour of Rathke's pouch. This is not the only instance in which similar symptoms may result from anterior pituitary and cortical adrenal lesions, as will be seen below.

Now Evans and Simpson¹¹ have been able to isolate a hormone from the eosinophile cells, which is concerned with growth, and another from the basophile cells, which is concerned with sexual development. Moreover there is a definite antagonism between them, the growth hormone being capable of completely nullifying the other if they are simultaneously injected. That

growth precedes sexual maturity is presumably due to the early predominance of the growth hormone. When the basophile cells are able to assert themselves over the eosinophile, puberty occurs. The association between the eosinophile cells and growth is indicated by the coincidence of eosinophilous adenomas with gigantism or hemihypertrophy, if they developed before the epiphyses join up, and acromegaly if they develop after this date. Sometimes gigantism is quite partial—as in one finger. Beware of removing such local gigantisms, the operation has been followed by a gigantic growth of the whole limb*.

The association between the basophile cells and sexual development is, perhaps, best illustrated by certain cases of virilism in women. I have been particularly interested in the type described by Achard and Thiers as "diabetes of bearded women". There are six characteristics, of which only the first three are essential. (1) Hirsuties on the face, masculine in type, with partial baldness of the frontal region. (2) Obesity. (3) Disturbed genital functions. (4) High blood-pressure. (5) Cutaneous striæ. (6) Glycosuria, or at least lowered carbohydrate tolerance. I have described cases presenting all these features, with increased basal metabolic rate in addition. In the cases collected and described by Achard and Thiers¹² the necropsies, when obtained, generally showed adenal or pituitary tumours. One such case I saw had a basophilic adenoma of the anterior pituitary, another had bilateral hypertrophy of the adrenal cortex. I have discussed this type of case elsewhere¹³ and will here merely insist

* Since writing the above, Susman, in an interesting paper (*Brit Med Journ*, 1931, ii, 794), puts forward the hypothesis that in malignant disease the anterior lobe of the pituitary is over-active, and the posterior lobe under-active. He has treated a few cases of malignant disease on this hypothesis with pituitrin, sometimes in combination with ovarian extract and a low carbohydrate diet. He states that all the cases showed regressive changes in the tumours, and life appeared to be definitely prolonged.

on its bearing on Evans and Simpson's experiments and as again showing the resemblance between the symptoms resulting from certain pituitary and adrenal lesions.

P E Smith found that after castration the anterior pituitary becomes engorged with basophilic elements, and pituitary glands so modified are particularly effective in restoring experimentally produced sexual dystrophy. It would therefore appear that in both sexes an obligatory cessation of sexual activity leads to storage of the pituitary sex hormone in that gland. Conversely Evans¹⁴ found that a continuous administration of this sex hormone leads to cessation of oestrus, as if it stimulated the ovary to the point of exhaustion. Rhythm is the essence of reproductive function; and this fact should be borne in mind in the clinical use of sex hormones.

The anterior lobe produces two other hormones one concerned with the reproductive side, assisting in the formation of corpora lutea, and the rhythmical changes in the uterine mucosa to receive the ovum. Hartman has recently shown that oestrin is powerless to effect this in the absence of the pituitary; the other with the metamorphosis of such animals as go through this phase. Apparently this latter hormone acts through the thyroid. We must therefore postulate four hormones in the anterior pituitary regulating (1) growth, (2) sexual development, (3) luteinization, which stabilizes pregnancy, (4) metamorphosis from a larval to an adult state.

But the anterior lobe also contains cells which resist staining, the so-called chromophobe cells. Their function is unknown; all that can be said is that an adenoma composed of such cells actually diminishes pituitary function, but apparently only due to direct pressure on the chromophil cells. The original cases described of Frohlich's syndrome were due to chromophobe adenomas. But P. E. Smith found that in

rats, removal of the pituitary below the dura mater only led to inhibition of growth and sexual activity, while an injury above this level caused marked obesity. Richter¹⁵ produced persistent polyuria also in this way. Complications such as obesity and polyuria, therefore, imply that more than the anterior lobe is involved.

The *pars intermedia* seems in general to belong functionally to the posterior lobe, but to possess one specific function. It has been known for some time that a tadpole from which the pituitary has been removed becomes albino through contraction of the melanophores in the skin, and that re-implantation of a pituitary will neutralize this effect. More recently Allen¹⁶ has shown that it is only necessary to transplant the *pars intermedia* to do so. The antithesis between defects of this part of the pituitary and of the adrenal medulla in respect of pigmentation is the more interesting because of the synergism between the anterior pituitary and the adrenal cortex in respect of growth and sexual development. The *posterior lobe* has been known for some years to be the source of pituitrin, but some three years ago it was established by the researches of Kamm¹⁷ and others that this really contained two active principles. *Oxytocin* or *pitocin*, which stimulates uterine contraction, and *vaso-pressin* or *pitressin*, which raises blood pressure, affects diuresis and antagonizes insulin.

The oxytocic effect of the pituitary seems to be purely chemical in origin, as it can be produced under conditions which exclude nervous influences. Thus P. E. Smith found that after total removal of a rat's pituitary, leaving the tuber untouched, the uterine muscle fibres atrophied and lost their wave-like contractibility. They became normal again after pituitary transplantation. With regard to oxytocin, it must be remembered that the ovarian hormone will stimulate its secretion, while the luteal hormone inhibits it (Dixon and Marshall). In this way the corpus luteum provides

for the maintenance of pregnancy, and, as Frankel¹⁸ previously showed, its destruction inevitably leads to abortion. When the corpus luteum begins to degenerate, this inhibitory effect ceases, and the ovarian hormone initiates parturition by stimulating the production of pituitrin. As Dixon¹⁹ said, it is remarkable that medical men in empirically using pituitary extract to stimulate uterine contractions, should have adopted the method which Nature has employed from time immemorial. In the same way, the pituitary seems necessary to the involution of the uterus after pregnancy, and Leslie Pugh²⁰ has found that a persistent corpus luteum in the cow led to subinvolution.

The vasomotor effects of pitressin, although the first function to be discovered, have been rather overshadowed by those of adrenaline. Yet, as between the two glands, the pressor effect of emotion would be more likely to be produced by the one so much nearer the emotional centres. And emotional explosions with an accompanying rise of blood pressure have recently been observed to occur in an animal whose cortical inhibitions have been removed by severing the nerve paths from the frontal cortex to the diencephalon.

The anti-diuretic effect Diabetes insipidus is a pathological illustration of the close anatomical and physical connection between the posterior lobe and the diencephalon. In tadpoles the infundibular protrusion down from the brain does not occur if the epithelial invagination is removed, while a transplanted epithelial rudiment fails to develop unless some of the nervous tissue is taken with it. Hyaline bodies are found in the posterior lobe which pass towards the third ventricle. If the stalk of the gland is obstructed by a clip, the part below becomes swollen with this hyaline material, and persistent polyuria results. There was a tendency a few years ago to ascribe diabetes insipidus not to the pituitary but to the overlying diencephalon. While

it is true that in some cases the diencephalon alone is damaged and in others only the pituitary, it is highly improbable that corresponding effects should be produced by lesions in these two situations if there were no functional interaction between them. And the foregoing observations show that some secretory interaction exists. Since the posterior pituitary produces an anti-diuretic hormone, which will act on a denervated kidney, the logical conclusion would appear to be that, even when the diencephalon is responsible, it must act, not through a nervous, but through a chemical mechanism, and that this mechanism resides in the underlying pituitary.

Carbohydrate metabolism—Hyperpituitarism has long been known to be associated with a lowered carbohydrate tolerance, and not frequently with glycosuria. Such glycosuria is usually intermittent, and during the intermittence I have sometimes found the blood-sugar curve completely normal, while during the glycosuric period this was distinctly raised. Here again, the pituitary function shows a rhythmical variation. Conversely in hypopituitarism there is a raised carbohydrate tolerance. When insulin was discovered, J. H. Burn soon showed that, as might be expected from these facts, it was antagonistic to pituitrin. He subsequently showed that this is due to the vasopressin fraction.²¹ Hence the lowered carbohydrate tolerance in hyperpituitarism. G. Graham²² has utilized this to check hypoglycæmic reactions after insulin. By adding 10 per cent of pituitrin units to the units of insulin, the blood-sugar is brought down more gradually, prolonging the effect of the insulin and making it less disturbing. Since the antagonism between insulin and pituitrin appears to be due to their opposite effect on the storage of glycogen, the former increasing and the latter diminishing it, one could interpret this beneficial action of pituitrin as a check on any excessive storage of carbohydrate, when it is

really required for current needs.

Galactagogue effect—It is not yet clear whether the so-called galactagogue effect of pituitrin is due to pitocin or pitressin. It is usually stated that this is merely due to a contraction of the muscles in the mammary ducts, but this would hardly account for three cases of pituitary tumour I have seen associated with lactation lasting 7, 3, and 2 years respectively. Cushing²³ reports instances of lactation lasting five to seven years in acromegalic women, he believes it to be an indirect effect of the pituitary acting through the ovary. I have seen this prolonged secretion cease promptly after the administration of corpus luteum. The sharp bi-temporal headache sometimes suddenly experienced by a woman on putting the child to the breast appears to be due to the demand made upon the pituitary, and I have known it to be relieved on giving pituitary extract.

Fat metabolism.—Froehlich's syndrome called attention to the association between pituitary lack and obesity. While it has recently been clearly proved that so-called pituitary obesity follows supra-sellar damage, produced either experimentally or by diseases such as tumour or encephalitis, we cannot therefore exclude the secretion of the posterior pituitary from participation in this. Far from it. Removal of the pituitary of a tadpole leads to a large and persistent fat organ. This fat persists, even after starvation, but is soon absorbed when pituitrin is injected. This accords with Coope and Chamberlain's²⁴ observation that pituitrin injections lead to increase of fat in the liver, while the fat in the blood and peripheral tissues diminishes. Leathes²⁵ had previously shown that saturated fat is sent from the tissue depots to the liver to be desaturated before it can be metabolized, hence the accumulation of saturated fat in the liver in hepatic toxæmias, and hence the obesity of hypopituitarism. In the first case there is failure of fat combustion, in the second there is a failure in fat

transport. And, as we know, this fat tends to accumulate particularly around the limb girdles. From the close association between the gonads and the pituitary we can understand why castration or gonadal defects lead to obesity. But here again there is that blending of chemical and nervous mechanisms which is so characteristic of the pituitary, for Raab²⁶ showed that pituitrin injected into the cerebral ventricles is much more effective in promoting fat metabolism than when given subcutaneously. Yet this action is abolished by severance of the nervous channels between the pituitary and the liver at any level, as well as by drugs which are supposed to paralyse the heat-regulating centres. It would also appear from Raab's work that fat metabolism in the liver, under the influence of pituitrin, has much to do with the maintenance of the body temperature. This accords with Cramer's²⁷ observations on the influence of the thyroid-adrenal-pituitary group of endocrines on heat regulation.

The diencephalo-pituitary apparatus and the emotions.
—That emotional expression largely springs from the basal ganglia is well recognized. Cushing²⁸ described a tumour in the optic chiasma invading the thalamic region in a girl aged 13 years, there was successively loss of vision, disturbance of fat and water metabolism, of thermal regulation, of sleep and possibly of vasomotor regulation. Finally, the removal of cortical inhibition left the patient in a state only comparable with the "sham rage" described by Cannon and others²⁹ in decorticated animals. In contrast with this, the tumours of Rathke's pouch which act by pressure rather than by invasion lead to indifference or negativism.

Space forbids the description of Fee and Parkes'³⁰ experiments on rabbits, showing that the act of mating set going some excitatory impulses which promptly release the sex hormone from the anterior pituitary.

Zondek³¹ speaks of this hormone as the motor which sets the reproductive cycle going, but as Cushing²⁸ says, the emotional self-starter is probably in the diencephalon

These various observations throw light on some of the psychological accompaniments of pituitary disease. Many of these are closely similar, whether associated with excess or defect of pituitary activity. It would be better to speak of the psychological effects of *dyspituitarism*, presumably due to disturbance of the relations between the gland and the diencephalon. Such patients tend to lack inhibitions, they may have uncontrollable outbursts of temper and may lie and steal, committing offences in a foolish pointless way, often apparently merely to attract attention. They try to compensate for their feeling of inferiority by a craving for the limelight as if they cannot achieve this with their equals they seek it from their social inferiors. They are very prone to fantasy-thinking, seeking a dream world in which to escape from this feeling of inferiority. Fantasies of pregnancy, for example, are not at all uncommon.

TABLE OF PRINCIPAL PITUITARY FUNCTIONS AND DISEASES

		Diseases from	
Secretion		Over action	Under action
Anterior lobe	Growth hormone from eosinophilic cells	Gigantism Hemi-hypertrophy Acromegaly	Dwarfism Progeria.
	Sex hormone from basophilic cells	Virilism	-
	Pitocerin, contracting the uterus	-	-
Posterior lobe	Pitressin, raising blood pressure, affecting diuresis and antagonizing insulin	Pituitary glycosuria	-
			Of both lobes Fröhlich's syndrome Some cases of subinvolution of the uterus. Diabetes insipidus.

Progress is always in a spiral; our knowledge has now come round to a point whence, from a higher altitude, we can regard sympathetically the views expressed by Ridley in 1695, for we realize how, in effect, the pituitary often repeats chemically what the brain has already registered. Nowhere are chemical

and nervous factors so closely associated as in this pituitary-diencephalic region; primitive emotions and fundamental instincts cluster thick around it, and through it the rhythm of life is largely regulated

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Thyroid Extract as a Therapeutic Agent:

Some Indications, Results and Difficulties of Treatment

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THE therapeutic value of thyroid extract is so well known that some apology is perhaps needed for introducing this subject. My grounds, however, for doing so are that a critical survey of the results of thyroid treatment in a number of conditions in which it is supposed to be beneficial does not appear to justify its use in such an extended field. It is entertaining to review the list of diseases which some of the more enterprising manufacturers of endocrine products regard as amenable to thyroid treatment. The price-list of one well-known firm includes under this heading forty-four conditions, which can arbitrarily be divided into four groups—first, cretinism and myxoedema, secondly, simple goitre, mental backwardness, defective growth and delayed development in childhood, obesity, menstrual disturbances, sterility, repeated miscarriages, and certain skin diseases in adults, thirdly, asthma, urticaria, nocturnal enuresis, mucous colitis, and other conditions, many of them allergic in nature, and fourthly, a mixed group, epilepsy, Raynaud's disease, and various other symptom-complexes of doubtful etiology. No medical man would accept these indications for thyroid treatment as they stand. The experience of the majority would, no doubt, suggest that in groups three and four thyroid extract is of little therapeutic value. It has certainly been my experience that these conditions are but rarely

associated with hypothyroidism. To take the example of epilepsy, for instance, there was no instance of its occurring in any of the cretins or myxœdematous patients here reported, nor, for that matter, in the group of epileptics whose basal metabolism was investigated, the results of which have been incorporated in the table of "Basal metabolism investigations in non-thyroid conditions," was there more than a small percentage of subnormal readings. On the other hand, all would agree that thyroid extract is a specific cure for the conditions in group one, whilst in the second group any of the disorders named might be symptomatic of hypothyroidism.

It has, perhaps, only recently been fully recognized that thyroid deficiency is a protean disease and may present itself under various guises. It may moreover be extremely insidious in its onset and the early symptoms of ill-health may pass unrecognized by the patient. This is no doubt partly due to the slowing up of all mental processes which is one of the early features of the disease. To illustrate this, of the first 101 consecutive cases of myxœdema seen by me, in 50 the thyroid condition was only recognized by the physician during the course of some intercurrent illness. The individuals had not previously complained of ill-health. In the other 51 cases, the patients sought medical advice for symptoms which were attributable to hypothyroidism. Nineteen complained of general swelling of the face, body, hands and feet, seventeen observed loss of power and sensory disturbances, pins and needles and numbness in the limbs, eighteen mentioned as one of their first symptoms lethargy, weakness and undue liability to fatigue. Other symptoms complained of were menorrhagia and floodings (9), subjective feelings of cold (9), alterations in voice and speech (9), loss of hair (6), and loss of memory (5). Other patients with hypothyroidism may seek medical advice for obesity, sterility, repeated miscarriages or

stillbirths, or chronic rheumatism. It is these minor manifestations of thyroid deficiency which will receive special attention in this article, for they are only now beginning to receive the recognition they deserve

The presence of clinical features of hypothyroidism is the true criterion for the use of thyroid extract, and if the clinical diagnosis is in doubt valuable corroborative evidence may be obtained from an investigation of the basal metabolic rate. This test in thyroid disease corresponds in value to the blood count in anæmia. If it is below the normal level in the presence of clinical symptoms of hypothyroidism, there is an adequate reason for instituting thyroid treatment and every prospect of success.

THYROID EXTRACT AND BACKWARD CHILDREN

Thyroid deficiency, congenital or developing in childhood, produces striking disturbances of growth, delay in sex development, and mental retardation. All



FIG 1—T G, aged 6, untreated, two carpal centres present, approximately four years' delay



FIG 2—G B, aged 4, treated since the age of 1½ years, six carpal centres present, normal

these conditions may be produced by a variety of other causes, but when thyrogenic in origin are generally found combined. This is a point of considerable



FIG 3—L C, aged 10½, untreated, three carpal centres present, approximately 7 years' delay



FIG 4—M G, aged 9½, treated since three years of age, normal development for age

diagnostic significance. Here they will be considered separately.

(A) *Defective growth*—The characteristic growth disturbance of thyroid deficiency is a disproportioned dwarfism, that is the limb measurements are unduly short when compared with the trunk. This is the result of a retardation of bone development which is especially noticeable in the long bones of the limbs. Radiography is particularly helpful in diagnosis. The characteristic findings in the hands and wrists of untreated and treated cases are illustrated in Figs 1-4.

Skeletal measurements are also important in diagnosis. The usual measurements taken are those from symphysis to vertex and symphysis to soles. If the lower measurement is unduly short, thyroid deficiency may be suspected. Other conditions of disproportioned dwarfism from which this particular type has to be differentiated are those due to anterior lobe pituitary deficiency and the various forms of rickets. In the former a similar delay in bone development is shown by radiography, whilst in rickets typical deformities occur and characteristic ricketty changes will be found in the epiphyses. In none of these conditions, however, will there be the same degree of mental retardation as is usually found in thyroid deficiency.

The effect of thyroid treatment on the growth of thyroid-deficient children is well illustrated in Tables 1 and 2. In Table 1, the physical measurements of a series of previously untreated cases have been compared with the normal standards of height and weight for age (Holt. "Standards of Nutrition") In Table 2

TABLE 1—CRETINISM AND JUVENILE MYXEDEMA—PREVIOUSLY UNTREATED

(a) *Cretinism*

No	Name	Sex	Age	Ht in cms	Below average for age	Wt in lbs	Below average for age	Bone development delay
					cms	st. lbs	lbs	
1	TG	m.	6	93 75	-15 25	2 7	-9	3 yrs
2	LC	m	10½	106 25	-26 75	3 11	-16	7 yrs
3	LP	m	9	108 5	-17 5	3 4	-14	—
4	DC	f	17½	131 5	-27 1	6 8	-26	2 yrs
5	D.D	f	27	132	-26	6 0	-36	10 yrs
6	FF	f	38	137	-18	6 5	-32	13 yrs
7	FO	f	15½	119	-37	?	?	—
8	AB	f	12	114 5	-26 5	4 4	-16	—

(b) *Juvenile Myxedema*

9	ES	f	17	132	-27	6 5	-32	2 yrs
10	AE	f	15	127	-28	4 3	-47	—
11	EW	f	13	122	-24	6 2	-1	1 yr
12	RT	f	10	142	-17	5 1	-53	—
13	AG	f	16	140	-7	6 8	-20	—
14	EY	m	11	122	-18	4 0	-16	—

TABLE 2—CRETINISM AND JUVENILE MYXEDEMA—PREVIOUSLY TREATED

No	Name	Sex	Age	Ht in cms	Com- parison with average in cms.	Wt in lbs.	Com- parison with average in lbs.	Bone develop- ment	Treat- ment since age of
1	GB	f	4	96 25	+ 5 25	3 1	+ 7	Normal	1½
2	DH.	m.	6	115	+ 6	4 0	+12	—	2
3	ID	f	7	95	-17	2 8	-12	—	3½*
4	DC	m.	8½	115	- 8	3 8	-7	-3 yrs.	5½*
5	MG	f	9½	128 75	+ 2 75	5 9	+20	Normal	3
6	MP	f	11	116	-18	3 1	-25	—	1*
7	CB	m.	11	138	+ 2	5 8	+ 6	—	3
8	JH	m	12½	144	+ 2	6 2	+ 7	Normal	10
9	RB	m.	13	143	- 2	5 11	- 1	—	12
10	JB	f	15	158	+ 3	10 0	+34	Normal	3
11	PW	f	15	141	-14	5 13	-21	—	1*
12	DE	f	15½	124	-31	4 6	-46	—	13*
13	AM.	m.	19	162	- 8	8 12	-15	Normal	6
14	VB	f	23	148 5	-11 5	7 3	-23	Normal	2½
15	FH	f	31	125	-35	5 0	-50	-11 yrs	for 2 yrs at 21 *
16	NL	f	7½	111	- 4	2 12	- 9	—	2
17	ML.	f	14½	145	- 8	7 4	+ 1	—	4½
18	JH.	m	12	141 25	+ 1 25	6 2	+10	—	?

* Inadequate treatment

a similar comparison has been made in previously treated cases, the age at which treatment was commenced being recorded in column 10. In a few of the second group of cases, treatment had for various reasons been inadequate. The resulting growth failure will be observed. The difference in physical development attained in the two groups is obvious (see Figs. 5 and 6). In the untreated cases there is a considerable defect in height and weight as compared with the average in every instance, and bone development is delayed. The treated cases, on the other hand, apart from the few exceptions mentioned, compare favourably with the normal standards. The rate of growth of a thyroid-deficient child when first treated with thyroid extract is often remarkable, and if there is much leeway to make up this may amount to as much as 7 or 8 inches a year, as was the case in E W (Table 1) (See also Figs 7A and 7B) In this instance, when the child's attendances for treatment subsequently relapsed

for a period of eighteen months the rate of growth fell to $\frac{1}{2}$ inch a year.

(B) *Backward sex-development*—The delay in sex-development which results from thyroid deficiency,

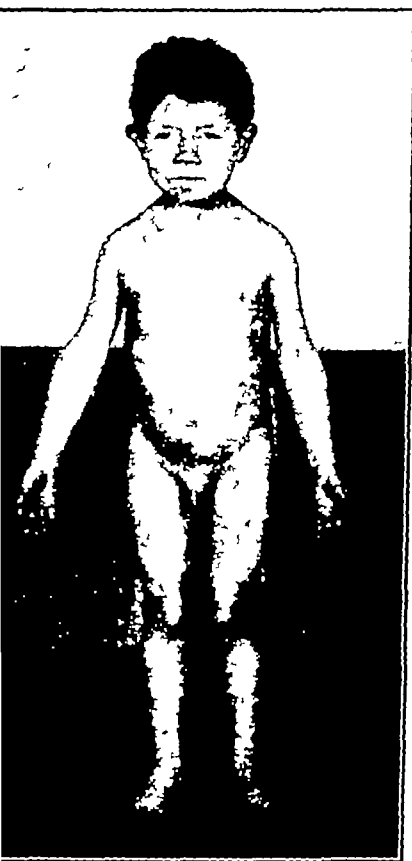


FIG 5—L P, aged 9 years, untreated

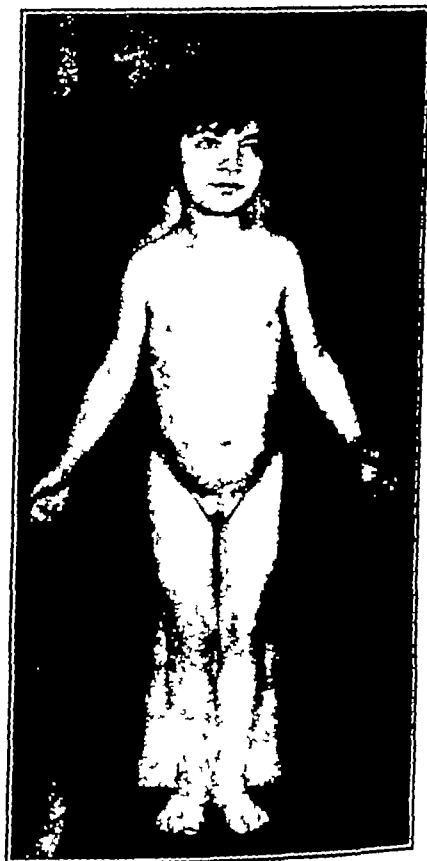


FIG 6—M J, aged 5, treated since age of 2 $\frac{1}{4}$

congenital or developing in childhood, is generally severe. In untreated or inadequately treated cases, puberty may be indefinitely delayed, the secondary sex characteristics failing to appear and primary amenorrhœa resulting. In minor grades of deficiency, on the other hand, some degree of sex development may be attained, but a primary menstrual irregularity result (see Fig. 8). In successfully treated cases, on the

other hand, the changes of puberty occur at the normal time or perhaps a little late, and subsequently menstruation is generally normal and regular (see Fig 9). In one case of typical cretinism treated from an early age

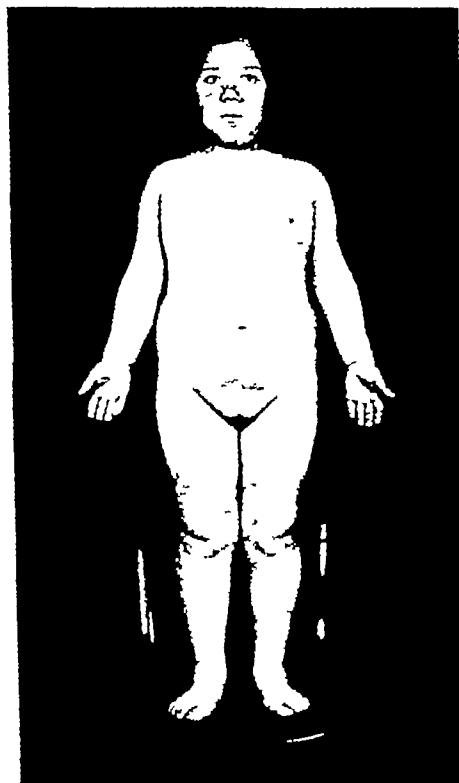


FIG 7A.—E W, aged 13 years
Juvenile myxedema untreated



FIG 7B.—Same patient after three
months on thyroid extract

and seen by the writer, a normal pregnancy occurred. This, however, is an unusual occurrence in true cretinism

(c) *Mental backwardness.*—The high-grade mental defects characteristic of endemic cretinism are not often found in the sporadic cases in this country, though some degree of backwardness is the usual accompaniment of hypothyroidism in children. It

can, however, be improved by thyroid treatment. In this type of case, to obtain the best possible result the importance of early and adequate treatment cannot be over-emphasized. If treatment is commenced late, mental development may remain much below the

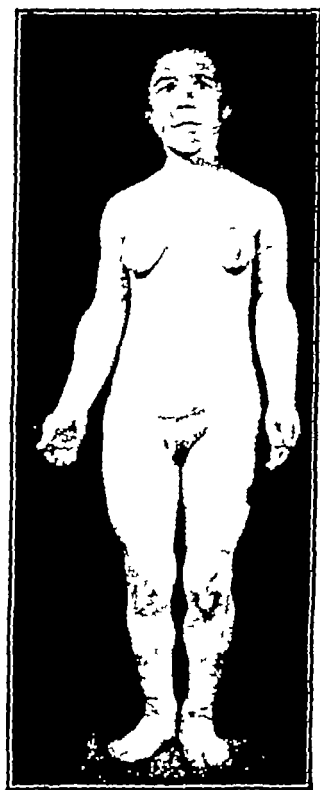


FIG 8—F.H., aged 31 years, untreated until 21 years of age, puberty at 21. Note short lower limbs

normal and the years lost before thyroid is administered seem never to be regained. Reviewing my cases it would appear that the improvement in mental development is seldom as great as that on the physical side, though isolated instances have occurred in which normal standards have been attained. In the congenital cases, which are usually not recognized until

the age of twelve months, or even later, a well-marked intellectual retardation generally persists

THYROID EXTRACT AND SIMPLE GOITRE

Thyroid extract is often useful in the treatment of simple goitre, its chief indication being the presence of symptoms of hypothyroidism. Its use is not alto-

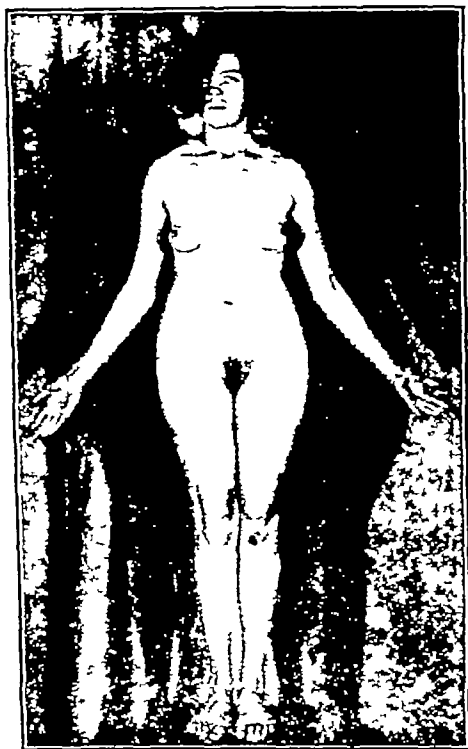


FIG. 9—M. G., aged 15, cretin treated since 3 years of age, puberty at 13, menstruation regular. Note normal proportions.

gether unattended with risk in some of these cases (*vide* p. 647, Table 6)

Simple goitre may be of two main types, diffuse or nodular, i.e. colloid or adenoparenchymatous. A simple hypertrophy is the basis of the former, a hyperplasia

and the formation of new glandular tissue of the latter. The nodular goitres are probably a later stage of the diffuse, and they are usually found in older patients and more likely to be associated with hypothyroidism. Thyroid extract in such cases will control the symptoms of hypothyroidism, but cannot be expected to produce any striking alteration in the size of a gland in which permanent structural changes have occurred. This, however, is usually a relatively unimportant matter, though it should be explained to the patient before treatment is commenced. The use of thyroid extract in simple goitre is not confined to the nodular types. It is often beneficial in the quiescent stage of diffuse goitre in which some diminution in the size of the gland may be expected. It is, however, inadvisable to employ thyroid extract during the early stages, for at this time there are often symptoms suggestive of mild hyperthyroidism. These usually readily respond to preliminary treatment with iodine. The importance of iodine in the prevention of goitre is now well established. It is, however, generally recognized that simple goitres, once developed, are not often curable by iodine, unless it is administered in the early stages. When this period is passed, the administration of thyroid is well worth a trial and essential if there are symptoms of hypothyroidism.

THYROID EXTRACT IN GYNÆCOLOGICAL DISORDERS

The field of usefulness for thyroid extract in the gynæcological sphere includes the treatment of certain disturbances of menstruation, cases of sterility, and of repeated miscarriages and still-births found in association with hypothyroidism.

(A) *Menstrual disturbances.*—Amenorrhœa and menorrhagia may both be found with hypothyroidism. This apparently anomalous statement requires some explanation. Thyroid deficiency developing in childhood, if untreated, results in a failure of sex development and

delay in the appearance of puberty and menstruation. The severe forms may be associated with primary amenorrhœa, the mild grades with a primary menstrual irregularity. Both are amenable to thyroid treatment. In the thyroid deficiency of later life, however, amenorrhœa is seldom, if ever, found as a result of the disease. It may be present as a symptom, especially in myxœdematous women about the time of the climacteric, but if the histories of these cases are carefully analysed, it will be found that the ovarian defect—the climacteric—generally preceded by several years the onset of myxœdema. When, however, myxœdema develops before the climacteric, menorrhagia is the rule in about 75 per cent of cases. In the remainder the menstrual losses are unchanged. This tendency to excessive bleeding in a considerable proportion of cases of thyroid deficiency developing during the active sex life is important to bear in mind, for its recognition will often save the undertaking of extensive pelvic operations for a condition which is usually readily controlled by thyroid extract. The indications for thyroid extract, therefore, in disturbances of menstruation are the developmental amenorrhœas of early life and the menorrhagias of adults of hypothyroid origin. It will seldom be of use in conditions of secondary amenorrhœa for, in the writer's experience, these are rarely of hypothyroid origin.

(B) *Sterility*—That sterility may result from thyroid deficiency has long been recognized, in fact, in myxœdema it is the usual finding. Successfully treated cases have been reported by various authors, including the writer and Forest Smith, who recently published a series of sixteen cases cured by thyroid treatment. The sterility was either of the primary or secondary type, in the former no conception having occurred, in the latter the condition having developed after one or more pregnancies. The period of sterility in these patients varied from between three and eleven years,

and the duration of treatment before conception from between two months and two years. Some degree of obesity was invariably present and the basal metabolic rate in those cases in which it was investigated was low. Menstruation was normal and regular, or the losses were excessive in all but two cases in which a primary developmental menstrual irregularity of thyroid origin had persisted into adult life. The presence of menstruation seems to be a point of great significance in assessing the likelihood of success in treating these cases, for the writer has not met with a case of sterility and secondary amenorrhœa which has responded to treatment with thyroid extract. This is probably explained by the fact already referred to that secondary amenorrhœa is seldom primarily of hypothyroid origin. The results of pregnancy in all but two of these sixteen cases were eminently satisfactory, a full-term healthy child being born. In one case a miscarriage occurred at three months, in the other the child died just before term during a Cæsarean section.

(c) *Repeated miscarriages and stillbirths.*—In lower grades of thyroid deficiency whilst conception may occur, there may be a tendency to miscarriage or stillbirth. This is probably due to the increased strain on thyroid function which results from the pregnancy. It may cause a further hypertrophy of a simple goitre or symptoms of hypothyroidism. Miscarriage or stillbirth can often be avoided in these cases by the administration of thyroid extract during pregnancy. That the condition is by no means uncommon can be seen from my series of cases selected at random and reported in Table 3, seven had had no treatment for hypothyroidism, whilst eight had received thyroid extract during their successful pregnancies. The difference in the results is striking.

A good illustration of an untreated case is No 1. Here four healthy children were born and the fourth pregnancy resulted in twins. This was accompanied

TABLE 3—REPEATED MISCARRIAGES AND STILLBIRTHS

No	Age	M.d.at	Pregnancies	Thyroid history	Treatment
1	35	21	N N N N 13m	Simple pub goitre. Hypothyroidism after 4th.	Nil
2	49	34	m N * N *	Simple pub goitre Hemithyroidectomy at 34, followed by hypothyroidism.	Tr during 2nd and 3rd pregnancies
3	32	23	N N N N St.B. St.B m m. m	F H. goitre. Simple pub goitre. Hypo thyroidism following 4th pregnancy	Nil.
4	29	22	P(d) P(d) St.B P(d)	Simple goitre. Hypo thyroidism W.R negative.	Nil
5	27	25	N * m	Hypothyroidism B M R —17 3%	Tr during 1st preg not 2nd.
6	50	17	m m m	Hypothyroidism	Nil. till later life (Myxoedema)
7	60	25	N N m m	Simple goitre at 25, followed by myxoedema	Nil
8	30	22	N m. m. -	Hypothyroidism menor rhagia after 19	Nil.
9	32	29	m. m. m.	Simple goitre and obesity Hypothyroidism after marriage	Nil
10	32	25	P(d) N P(d)	Hypothyroidism B.M.R —15%	Nil
11	29	26	P(d) P(d) N*	Hypothyroidism B.M.R —38%	Tr during last pregnancy
12	25	23	m m. N* -	Father Ex. G Patient hypothyroidism.	Tr during 3rd pregnancy
13	23	20	m m. N m. N *	Hypothyroidism since puberty B.M.R —27%	Tr during 5th pregnancy
14	40	35	N m m. N *	F H. goitre and hypo thyroidism.	Tr during 4th pregnancy
15	31	27	m m N *	Hypothyroidism. Reg menstr	Tr during 3rd pregnancy.

N = Normal Pregnancy

m = Miscarriage.

* = Positive result after treatment

P = Premature

d = Died.

by a very marked hypertrophy of the thyroid, and subsequently symptoms of hypothyroidism developed which were not recognized or treated This patient became pregnant on thirteen occasions during the next seven years, each pregnancy resulting in a miscarriage at the third or fourth month A slightly different history is given in Case 2, for here the first pregnancy resulted in miscarriage This patient developed a simple goitre at the age of ten, for which a

hemithyroidectomy was performed just before marriage. This naturally resulted in an exaggeration of the thyroid deficiency and definite symptoms of hypothyroidism. She was, however, treated with thyroid extract and two subsequent pregnancies were successfully completed. The remaining patients in the table provide further illustrations of the difference in the results in treated and untreated cases. The histories are worth studying, as they give some indication as to the type of individual likely to benefit from thyroid treatment.

THYROID EXTRACT AND OBESITY

The value of thyroid extract in certain types of obesity is a matter of common knowledge. Its beneficial effects appear to depend on its well-known power of increasing oxidation and of raising the basal metabolism. It is particularly indicated, therefore, in those cases of obesity in which the metabolism is low.

Broadly speaking, there are two main groups of obesity, exogenous and endogenous. In the first the administration of thyroid extract is as inadmissible as it is indicated in the other. Exogenous obesity is due to excessive consumption of food or diminution of energy expenditure. Thyroid extract is of no value in the treatment of this type for the oxidative processes are quite normal. Moreover, if it is employed in these patients for any length of time it may produce detrimental effects on the heart and nervous system. Endogenous obesity, on the other hand, is amenable to treatment with thyroid extract. In this condition, owing to changes in metabolism and a low metabolic rate, average normal food consumption combined with average normal muscular activity results in the deposition of fat. Many of these cases are due to defective function of one or more of the ductless glands, more particularly the thyroid, the experimental removal of which in animals has been found to lower the basal

metabolism to 40 per cent. below the normal. A low basal metabolism in obesity is the chief indication for treatment with thyroid extract. What measure of success can be expected in these cases? It is obvious that patients suffering from endogenous obesity of long standing can never be made and kept thin. Many have excessive appetites, in addition to their metabolic abnormality, and dietetic restriction, therefore, must play some part in their treatment. Dietetic restriction alone is generally badly borne by these patients. Thyroid extract alone will reduce their weight to some extent, but with excessive intake, the results are disappointing. But by a combination of both methods of treatment, satisfactory results can be obtained, the rôle of thyroid extract being to enable the individual to take a fuller diet without putting on weight than otherwise would be possible. The results of this method in a series of the writer's cases, selected at random from those at present under treatment, are given in Table 4.

TABLE 4—ENDOGENOUS OBESITY
Results of Treatment

No	Name	Age	Onset of Obesity	Weight before Treatment	Minimum Weight Treatment	Present Weight	Duration of Treatment
1	G H	47	Birth - -	27/10	14/8	15/3	3 years
2	M B	71	Foll. childbirth -	15/-	10/11	11/2	4 years
3	M W	33	Hypothyroidism since 30	15/6	13/-	13/5	1 year
4	M E	38	Hypothyroidism since 28	12/3	10/4	10/4	Six months
5	M R	50	Puberty - -	15/-	11/11	12/9	2 years
6	M P	23	Birth - -	24/-	12/11	17/-	9 years
*7	M F	46	Birth - -	15/-	11/2	11/2	5 years
*8	M L	38	Foll. childbirth -	20/-	13/10	13/10	4 years
*9	M P	64	Foll. childbirth -	19/-	13/10	15/2	7 years
*10	M B	49	Climacteric	10/1	9/2	9/2	Six months
*11	M P	55	Birth - -	17/9	14/5	14/5	Six months

* Cases 7, 9, 10 arthritis both knees Cases 8, 11, arthritis one knee

THYROID EXTRACT AND ARTHRITIS

Thyroid extract has been recommended in the

treatment of both rheumatoid and osteo-arthritis, mainly on the grounds that relaxation and mucoid infiltration of articular ligaments, tendons and fasciæ occurs in myxœdema. These changes, together with increase in weight, may play a part in the production of some cases of chronic arthritis. In my experience, however, the indications for thyroid extract in the rheumatoid form are limited to a few comparatively rare cases in which symptoms of hypothyroidism appear in the late stages. This is possibly an end-result of hyperthyroidism during the active stage, when the thyroid and joint condition are probably due to focal infection. If hypothyroidism is present in a case of this sort, there is reason to hope that thyroid extract may be beneficial. It should not, however, be employed until all signs of activity in the joint condition have disappeared and all evidence of focal sepsis been dealt with. The problem in osteo-arthritis is somewhat different, and there is one particular form of this disease in which thyroid extract, in conjunction with dietetic restriction may produce strikingly beneficial effects if used in the early stages. The joint changes found are of the hypertrophic variety and generally confined to the knees. The individuals are fat and usually women. The obesity is of the endogenous type and may have been present for many years. In some cases it dates to birth or puberty, and has been associated with flat foot and knock knee, changes attributable to overweight. There is generally a further increase in weight at the climacteric, the stage at which the arthritic symptoms are liable to appear. At this time there is usually a lowering of metabolic processes which, in conjunction with the weight increase probably plays an important etiological part in the arthritis. These patients often benefit from dietetic restriction and thyroid, measures which raise their metabolism, reduce their weight and lessen the strain on the joints of the lower limbs. The last five

cases in Table 4 are instances of arthritis with obesity now being treated in this way, the first three examples for a number of years, the last two only for six months. All five have experienced marked relief from symptoms, and in the long-standing cases the progress of the joint condition appears to have been arrested.

THE BASAL METABOLIC RATE

The basal metabolic rate, which has been referred to in this article as a valuable confirmatory test of disturbed thyroid function, is the rate of energy exchange in the body under basal conditions, i.e. after elimination of food and muscular exercise. In clinical work it can be measured indirectly by estimating the basal oxygen consumption of the patient. All that is required is the collection of a sample of expired air in a Douglas bag. The test can be carried out in hospital or in the patient's home. In practice it is usual to collect the sample in the early morning before the patient has risen or taken food. Under these circumstances there is little inconvenience. The subsequent analyses have to be undertaken in the laboratory. If these conditions are complied with, the basal metabolism will be found to be fairly constant for different individuals and to vary only between limits of ± 10 per cent. In hyperthyroidism the basal metabolism is raised, perhaps as much as 75–100 per cent. above the normal. In hypothyroidism and myxœdema it is low, in extreme cases as much as 40 per cent. below the normal. In other conditions it is generally within the normal limits, as will be seen from the results of 210 investigations in normal individuals and various diseases reported in Table 5.

In a few other endocrine disorders, notably hypopituitarism, in some diseases of the blood-forming organs, such as leukæmia, and in certain renal conditions with œdema, abnormal basal metabolic rate results may be found. Apart from these few exceptions,

TABLE 5—BASAL METABOLIC RATE IN A VARIETY OF CONDITIONS
(excluding endocrine, blood diseases and nephrosis)

	No of Cases	+10% +20%	$\pm 10\%$	-10% -20%
<i>Healthy Medical Students</i> - - - -	17	1	15	1
<i>Digestive</i> Dyspepsia, G U, D U, carcinoma stomach, chronic appendix, mucous colitis, chronic dysentery	30	4	24	2
<i>Cardiovascular, Respiratory, Renal</i> - -	17	3	10	4
<i>Metabolic and Deficiency Diseases</i> Exogenous obesity, malnutrition, scurvy, rickets, etc - - - -	30	3	23	4
<i>Diseases of Nervous System</i> Epilepsy, migraine, enuresis, etc - - - -	84	7	68	9
<i>Vasomotor and Trophic Disorders</i> Raynaud's disease, angioneurotic edema, lipodystrophy, etc - - - -	10	3	7	0
<i>Locomotor System</i> Myotonia, myasthenia, chronic arthritis, fragilitas ossium, etc -	12	2	7	3
<i>Various</i> Eye and skin conditions and chronic adenitis - - - -	10	1	9	0
	210	24	163	23

the normal limits are seldom exceeded, if the preliminary rest and fasting schedule is properly carried out.

It will be seen that in no case in the series were the limits of ± 20 per cent. exceeded, whilst in the majority of patients, more than 75 per cent results within the normal limits of ± 10 per cent. were obtained. This table is included to emphasize the value of the abnormal results found in thyroid disease. In hypothyroidism the test is not only valuable in diagnosis, but in controlling the results of treatment.

GENERAL PRINCIPLES OF THYROID TREATMENT:

DIFFICULTIES AND DANGERS

The therapeutic aim in a case of thyroid deficiency is clear. The basal metabolism must be brought to the normal level and there maintained by an appropriate daily dose of thyroid extract. If estimations of the basal metabolism are not available, accurate records of pulse-rate and weight provide a satisfactory substitute. The chief difficulties in the past in obtaining

the best results in the treatment of thyroid deficiency have been, first, the absence of any reliable method of judging the dose required and, secondly, the large number of different preparations of thyroid extract on the market and their tendency to vary in strength. Both these difficulties have now been overcome, the former by the introduction of the basal metabolic rate test, the latter by the general use of desiccated or dried gland preparations. The writer is of the opinion that to obtain consistent results, these desiccated preparations should be used in all cases. Synthetic thyroxine, recently introduced, appears to possess no advantage over the dried gland preparations.

In treating a case of thyroid deficiency it is generally a good plan to start with a small dose, one-quarter of a grain daily. Subsequently quarter-grain increases can be made at weekly or fortnightly intervals until the correct maintenance dose for the individual is found, for frank myxoedema usually from one and a half to two grains a day. This method of introducing treatment diminishes the risk of over-dosage and intolerance during the early stages and enables the optimum dose to be found without any difficulty. After taking thyroid extract for a short time, patients generally become extremely sensitive to their optimum dose and can readily recognize it.

It is often a problem as to whether dietetic measures should be employed in thyroid deficiency owing to the tendency of these patients to gain in weight. In the straightforward case without obesity dietetic restriction is unnecessary, and the diet should be adequate both in quality and quantity. In some circumstances when thyroid deficiency develops in a fat individual a moderate restriction of diet is often beneficial. Dietetic restriction, however, should not be enforced in thyroid deficient individuals unless thyroid extract is also given, for the basal metabolism is already low and will be further lowered by limitation of diet alone. This

results in a diminution of vitality and an exaggeration of symptoms, a response to diet which is characteristic of thyroid-deficient individuals and of diagnostic significance.

The chief risks in thyroid treatment are over-dosage and thyrotoxæmia, and the writer would draw a distinction between the two. The ill-effects of the former usually quickly pass off on withdrawal of thyroid and should seldom occur if the fractional method of administration at the outset be employed. If symptoms of over-dosage do arise, thyroid should be stopped for a week or two and then started again at half the previous dose. In routine administration it is often a good plan to warn the patient to omit thyroid for a day or two a week or for a few days each month to avoid cumulative effects. The effects of thyrotoxæmia are more serious and more lasting. In my experience this complication has generally arisen from the presence of a septic focus, or the taking of thyroid during an infective illness, such as influenza or tonsillitis. In other cases it has resulted from a shock, the death of a relative or a broken engagement, during thyroid treatment, or a surgical operation, especially on the pelvic organs or, in one case, irradiation of the ovaries. The chief symptoms are a persistent tachycardia and loss of weight, which are extremely difficult to control. In Table 6 are given the details of sixteen such cases which have come to my notice in the past ten years. It will be observed that even cretins and other cases of true hypothyroidism are liable to this complication. Two of the cretins in this series became thyrotoxic as a result of continuing to take thyroid extract during an attack of acute tonsillitis. One ultimately died of cardiac failure. Cases of simple goitre under treatment with thyroid extract seem especially liable to develop secondary thyrotoxæmia during an infective illness or when septic teeth are being removed for pyorrhœa, unless thyroid administration is stopped on these

OCCASIONS.

TABLE 6—THYROTOKEMIA FOLLOWING THYROID TREATMENT

No	Name	Sex	Age	Diagnosis	Prev Thyroid treatment	Thyrotokemia following	Result.
1	G B	f	7	Cretin	4½ yrs.	Ac. tonsillitis -	Thyrototoxic 6/12.
2	D C	f	17½	Cretin	1½ yrs	Ac. tonsillitis -	Thyrototoxic 6/12 Died cardiac failure.
3	W B	f	18	Cretin	Many yrs	Measles - -	Thyrototoxic 4/12
4	E B	f	39	Hypothy (sterility)	6/12	Pyorrhæa with removal of teeth.	Recovery Thyrototoxic 6/12 Recovery
5	B W	f	38	Hypothy	2 yrs	Influenza, Domestic worry	Thyrototoxic 6/12.
6	M.B	f	26	Adol. goitre Menorrhagia. F.H. Diabetes.	Nil	Irradiation of ovaries	Thyrototoxic, now Glycosuria. B.P. 230/120
7	A T	f	27	Simple goitre	12/12	? Cause	B.M.R. +44%. Hemithyroidectomy Recovery Med. Tr
8	E.M	f	20	Simple goitre (endemic)	2 yrs	? Cause	Recovery
9	H.M	f	54	Simple goitre Menorrhagia.	Many yrs.	Hysterectomy and double ovariect.	Hemithyroidectomy Recovery
10	C C	f	24	Simple goitre	12/12	? Cause -	B.M.R. +52%?
11	B.P	f	21	Adol. goitre	6 yrs	Shock of broken engagement	Partial recovery 6/12. Medical treatment.
12	M.M.	f	40	Adol. goitre	Many yrs	Climacteric	B.M.R. +33%. Hemithyroidectomy Recovery
13	F.D	f.	45	Simple preg goitre	Many yrs	Shock, trod on snake	B.M.R. +18%. Med. treatment
14	M.S	f	26	Adol goitre	9 yrs	Ac. tonsillitis Empyema Antrum.	Recovery after opn
15	M.W	f	50	Hypothy	Nil.	Hysterect and ovariect. sepsis	B.M.R. +61%. Uncontrolled.
16	M.E.L	f	45	Myxædema. Rh. Arthritis	3 12	Pyorrhæa -	Uncontrolled after 6/12.

A perusal of the details of these cases will show the importance of this complication and indicate the direction in which the danger lies. It is most advisable therefore when instituting thyroid treatment first to make sure that focal sepsis has been dealt with, and, secondly, to warn the patient to discontinue treatment if any of these eventualities arise. In conclusion, it cannot be emphasized too strongly that to obtain good results in the treatment of thyroid deficiency, especially in children, the diagnosis should be made at the earliest possible stage, and treatment with thyroid extract should be regular and continuous.

A Plea for the Earlier Recognition of Thyroid Deficiency

By H CECIL BARLOW, M B, L R C P

Honorary Physician to the Lincoln County Hospital

ABOUT eighteen years ago, the importance of this subject was unpleasantly brought home to me by the discovery that I was on the high road to myxœdema, and that the condition had been coming on for about two years. The diagnosis was made at sight by my old friend and teacher, Dr. R G Hebb, senior physician and pathologist to the Westminster Hospital, who met me by chance in the hospital. He was a somewhat laconic individual, so instead of commenting on my appearance, he sent me a post-card two days later, on which was written, "Try thyroid." I had not been well for two years, although working hard, and daily meeting other medical men, but none of them hinted that I was suffering from hypothyroidism, although some did remark that I did not look well.

As a result of this discovery I have ever since been on the alert to detect evidence of a failure of thyroid secretion in my patients, and I have been, and am immensely impressed by the large number of persons to be seen going about with obvious thyroid defect, which has probably been unrecognized and certainly not treated. I am forced to the conclusion that the average medical man is not nearly sufficiently alive to the condition.

The recognition of the facies of hypothyroidism, even when the deficiency is slight, is quite easy, when

once the mental picture is acquired All the textbooks on medicine give a fairly complete picture of myxœdema, but none stress the fact that minor degrees of thyroid defect are very much commoner than the fully established disease, nor do they help by pointing out the signs and symptoms to be looked for in minor degrees of hypothyroidism. By hypothyroidism I include all those conditions in which there is evidence of deficiency of thyroid secretion, either in quantity or quality, or both, short of complete absence as in myxœdema This deficiency may be slight or severe, transient or permanent, progressive or stationary. Varying degrees of hypothyroidism are responsible for a large amount of ill-health.

Strange to say, many sufferers do not recognize that they are ill They may admit that they feel more tired than they used to, that they feel the cold more than heretofore, that they are unduly sleepy, especially after meals, that their hair is getting thin, that exertion, both physical and mental, is more of an effort than formerly, and that their memory is becoming faulty; but if they are middle-aged—and they often are—they attribute this departure from their previous standard of health as being due to increasing age, and not to any abnormal deviation from good health which is capable of being cured by any treatment It is not surprising that they do not seek medical aid In my own case I did not think it necessary to consult anyone, because my troubles, especially if taken singly, would have seemed very trivial to a second person, although in the aggregate they caused very considerable disability

Many years ago, soon after I had in my own person experienced the great benefit of thyroid medication, I was constrained to put on paper what my own feelings and observations had been during the two years in which I had been gradually approaching a complete state of myxœdema, and this is

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If we wish to avoid failure in detecting hypothyroidism we must bear in mind all the signs and symptoms of myxedema. These are set out at length in the textbook accounts of myxedema but I only intend to emphasize those which are most commonly found in hypothyroidism. In some cases there may be only two or three symptoms, but the association of these is strong evidence that the thyroid is in default. The nutrition of the skin and its appendages is profoundly influenced by thyroid secretion, and here are often to be found the first evidences of deficiency. The skin is dry and inelastic, perspiration is absent and there is a shedding of the cuticle in the form of fine white powder. In the days when ladies wore black stockings it was safe to say to the hypothyroidic lady, "The insides of your stockings are covered with white powder," and she would be duly impressed. The hair of the scalp tends to fall out, at first mainly at the nape of the neck and in the temporal regions, and it may come out in patches or go grey. The hair on other parts of the body besides the scalp also falls off. It is very common to see the arms and legs of male patients quite devoid of hair.

One of the most important and distinctive signs, for it is present early in nearly all cases, is the "eyebrow sign." The outer third of the eyebrow is devoid of hairs or they are very scanty, the remaining hairs also are scanty, often coarse and arranged like the rays of a fan pointing upwards, giving the patient a rather stupid surprised expression.

The facies of hypothyroidism is distinctive, the skin is pale with often a slightly dirty yellowish tinge and a marked malar flush, the eyebrows are as above described, the eyelashes are often absent, the eyes tend to enophthalmos, the palpebral fissure being narrow, giving the eyes a piggy look. There is lack of the movements of expression. The general appearance is heavy and bloated, and there is an increase in weight

due to infiltration of all the tissues with a mucous-like substance and increase of fat due to deficient oxidization. Movements are slow and deliberate, as is also speech, due to infiltration of muscles and nerves. On the sensory side there may be impairment of tactile sensation, most marked in the fingers. For a considerable time I was quite unable to feel the facial artery when giving anæsthetics although my fingers were not noticeably thickened; the sensation returned after a month's treatment.

Of their slowness patients are often conscious, and if they have been of active or athletic habits, is a constant worry to them; will power does not overcome it, the muscles always seem to have the brake on, and the nerve impulses are tardily transmitted.

The skin of the whole body is dry and has a feeling like parchment. It may be affected by eczema, and ichthyosis is prone to occur over the malleoli and front of the ankles. Lack of perspiration is a very noticeable sign, these patients give off a scanty amount of invisible sweat, but hardly ever give off visible perspiration, even when taking strenuous exercise on a hot day. They often say that they think they would feel much better if they did, and that their skin feels dry and withered. After a few weeks' treatment the skin becomes nearly normal, the hair grows again and the sweat and sebaceous glands become active.

All hypothyroidic patients feel cold intensely, but they do not volunteer the information. This feeling cold is a very real thing, and may vary from perpetual discomfort to real misery. I can speak from bitter experience, for two years I never felt really warm. The warmth to be derived from sitting close to the fire, or wearing much clothing, does not give the same sense of well-being as a good healthy circulation supported by an efficient metabolism. These people do not get a good healthy glowing skin after a hot bath and vigorous towelling, nor do they after exercise. The symptom

may seem trivial, but if it is cured patients are eternally grateful.

With this subjective feeling of cold goes a subnormal temperature. The morning temperature may be as low as 96° F. and the evening temperature never higher than 97.5° F., at the same time the pulse is usually slow. A persistent subnormal temperature and slow pulse should always suggest that the thyroid may be failing. The following case illustrates the prominence of this feeling of cold —

A lady, aged 48, complained of always feeling cold. At night she could not keep warm in spite of innumerable blankets and two hot water bottles, and generally woke up about 4 a.m. shivering. Her skin was always dry and she never perspired. She was putting on weight and felt tired and sleepy. She had noticed her ankles were getting thick, her hair was coming out and receding from the forehead, the thyroid was decidedly small. Her temperature was 96° F. at 6 p.m. and her pulse was 80. Given half a grain of dry thyroid at bedtime. In ten days she said that she did not feel nearly so cold and did not wake up shivering. In three weeks she felt quite energetic, no longer felt cold, her hair had stopped coming out, her temperature was 98° F. in the evening and pulse-rate 70.

Myalgia and neuralgia are very common in hypothyroidism and people who have a subnormal temperature are particularly prone to attacks of these maladies if they are exposed to draughts or cold. In my own experience frequent attacks of myalgia in the shoulder muscles added greatly to my miseries. After a month's treatment I had no more myalgia. The value of noting the condition of the skin is well shown in the following case. —

A lady, aged 50, was complaining of severe pain in the right axillary region, which had been coming on for a week. She had always had good health and had been a good tennis player and was a keen golfer, but the pain prevented her from playing. I could find no physical signs to account for the pain, but warned her she might develop herpes. While examining her I noted that the skin was dry and satiny. She said that of late she never perspired and felt the cold much more than she did. Her movements were very slow and deliberate, and this was very noticeable to me as having known her as very quick and active. Her pulse-rate was 80 but her temperature was 97° F. The eyebrow sign was not present. She was given half a grain of thyroid once

a day. She did not develop herpes. After a fortnight she said she was "a new woman," and had not felt so well for years. She had lost an awful feeling of depression which she used to have on waking, was full of energy and had developed a wonderful appetite. The pain was gone at the end of a week.

The following case illustrates a number of important points:—

A lady, aged 39, complained of tiredness and weakness with shortness of breath, and that her voice had got husky during the last nine months. She had had a goitre ever since she was a girl and this got larger during her last pregnancy. A year and a half ago, during this last pregnancy, she had a severe attack of pain in the abdomen, and she had noticed that her skin was yellowish ever since. Her feet and ankles were swollen, and she complained of pins and needles in the hands and knees on waking. The periods were scanty. Her skin was dry and harsh and of a dirty yellow colour. There was no icteric tint in the conjunctivæ. She had a medium sized goitre, both lobes being equal. Her face had a puffy look with slight malar flush, the eyelids were swollen and there was enophthalmos. She was always sleepy and felt the cold very much. The eyebrow sign was present. After three weeks treatment she was almost well. The interesting features of this case are the goitre, the yellowish skin and the harsh voice. For years she had an overworked thyroid, probably trying to deal with some bowel infection, and the pregnancy, making an extra call on its activity, so exhausted it that it could no longer produce enough secretion for the needs of the body. The yellowish skin was probably due to cholelithiasis and cholecystitis, both of which are fairly common in hypothyroidism, the attack of pain suggests gallstone colic. She quite regained her normal voice after treatment.

In hypothyroidism the voice has often a peculiar intonation, it is harsh or husky due to infiltration of the vocal cords. The singing voice also is affected—its range may be greatly limited or it may be lost entirely. A case is on record of a professional singer who quite lost her voice. She consulted various laryngologists, who could do nothing for her. She was lucky enough to meet with a physician who noted the signs of hypothyroidism and treated her accordingly, with the result that her voice was completely restored. Personally, I completely lost my singing voice and used frequently to wake at night with a most horrible feeling of suffocation.

Many forms of intoxication can impair the functions

of the thyroid, often only temporarily. In some epidemics of influenza, many of the victims after a sharp attack, when the fever has subsided, fail to pick up, they often have a slow pulse and subnormal temperature, they are bankrupt of energy, physical and mental. Here the thyroid has suffered, and a short course of thyroid treatment will often restore their vigour. Septic infection can completely throw the thyroid out of action, as the following case shows.—

A lady, aged 54, had a large boil on the left temple. Suppuration was rather prolonged and she was much weakened by it. A month later her hair began to come out, she lost her eyebrows and eyelashes, her face was infiltrated and her eyelids were swollen. She felt the cold intensely, and her skin was dry and scaly. Her temperature was never above 96.5° F in the evening and her pulse was 66. She complained of occipital headache, especially in the morning. The thyroid was small. The effect of thyroid treatment was most successful, as she was practically well in a month. The thyroid recovered, for she left off the treatment at the end of two months and there was no return of the symptoms.

The influence of shock is well shown by the following case, which occurred at the 4th Northern General Hospital during the War.—

The man was admitted as a case of shell shock, having been blown up by a shell and buried. It was found that he had a fracture of the middle of the shaft of the femur. He appeared exceedingly dull and stupid, and movement of the fractured ends of the bone were singularly painless. The leg was put up on a 'Thomas' splint with twelve pounds extension with gum strips. In twenty-four hours he developed a severe pressure sore over the tuber ischi, the leg was taken down and a Liston's splint applied with a moulded poroplastic felt splint to the thigh. When taken down at the end of six weeks, there was not a sign of callus formation or union. During this time he had been very apathetic, except that he was always grumbling about the cold. His appetite was bad, he slept very heavily, his skin was very dry and his bed was always full of scales. His hair was coming out and his body was devoid of hairs. The fracture was put up again in the same way and he was given a grain of dry thyroid once a day. At the end of six weeks there was very fair union. He was quite active minded and took a lively interest in what went on in the ward. His hair was growing freely, and another of his troubles was cured, namely, nocturnal enuresis.

Three points in this case are worthy of note: (1) The hypothyroidism followed severe shock; I have seen

many cases of hypothyroidism coming on soon after a severe operation. (2) The influence of thyroid treatment on new bone formation, many cases of chilblains can be cured by thyroid medication alone, which suggests that calcium metabolism is influenced by the thyroid as well as by the parathyroids. (3) The cure of the enuresis, many hypothyroidic patients complain of frequent micturition and some of nocturnal enuresis. This is due to irritability of the bladder. Microscopic examination of the urine of these patients will often show large numbers of epithelial cells from the mucosa of the bladder; this is analogous to the shedding of the cuticle.

Thyroid has often been recommended for the nocturnal enuresis of children, but it is only successful in one type of case. These children are backward, they are mentally slow, their skin is dry and prone to eczema, and their thyroids are deficient in secretion.

Thyroid defect is decidedly more common in women than in men. This is not surprising when we remember the extra demand pregnancy makes on the thyroid; but hypothyroidism is far commoner in men than the textbooks would lead us to suppose, and it is more prevalent in cold climates.

At puberty, in girls, the thyroid enlarges to meet the extra call on it, but in some girls the response is not adequate, and they complain of scanty menstruation or amenorrhœa. These girls show signs of the insufficiency by coldness of the extremities, often have chilblains, and have a sullen demeanour and are mentally dull. Small doses of thyroid will often bring about a change for the better.

One form of rheumatoid arthritis is especially prone to appear at the menopause. It is the type with much thickening of the periarticular structures and gives rise to marked creaking, particularly in the knees. These patients tell you that their worst trouble is in getting up out of a chair or going down stairs. They are often

stout and show signs of hypothyroidism. They improve remarkably under thyroid treatment.

There are certain diseases which I have come to connect together, for they are often to be found in the same family and sometimes several of them in the same individual. They are hypothyroidism, eczema, urticaria, asthma, hay fever and mucous colitis. The last five are all related to some form of sensitization; it seems likely that failure of the thyroid plays some part in these conditions, for it undoubtedly plays some part in protecting us against toxins.

Some families have a tendency to suffer from thyroid derangement, one member may have Graves' disease, another myxœdema and another a simple goitre. I have had a family under my care in which the mother had a simple goitre, the eldest child had hypothyroidism, eczema and asthma, and the second child had hypothyroidism and eczema.

Symptoms referable to the nervous system are often among the earliest evidences of thyroid defect, there is an increasing mental dullness and lack of ideas, the memory for recent events fails, the mind is slow, the body is slow and the speech is slow. The patient sleeps heavily and is not refreshed; he wakes up tired in the morning, often more tired than when he went to bed. Headaches are common and may be occipital or frontal and are worse in the morning. The appetite is bad. A set of symptoms such as these may lead to a diagnosis of neurasthenia, the refuge of the bankrupt clinician, and so the patient may be labelled a hopeless chronic, whereas with a correct diagnosis his cure might be sure and speedy.

In my experience minor degrees of hypothyroidism are very common, and the condition is often missed because it causes a very vague, ill-defined condition of ill-health, which is frequently unnoted by the patients as any real departure from the normal, more especially as its onset is very insidious. The patients resign

themselves to being "not so young as they were," because they feel sluggish physically and mentally, their keenness for their favourite amusements, whether physical or mental, as golf or bridge, is not what it was. They feel that they have to drive themselves to do things which they formerly did with zest

Patients often consult their doctor on account of some complaint quite unconnected with the thyroid, but in whom the signs of subthyroidism may be noted; the remedying of this will facilitate the cure of the primary ailment.

There are few classes of cases where the physician can earn such lasting gratitude from his patients, and from which he can derive so much satisfaction, as in the diagnosis and appropriate treatment of cases of thyroid insufficiency. The treatment is so simple a tablet of a quarter to one grain of thyroideum siccum once a day is usually all that is required for most cases. The thyroid should be reasonably fresh, not more than two months old, it should be kept in air-tight bottles and should be obtained from a manufacturer who has a large output so that the strength may be uniform.

Septic Meningitis

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SEPTIC meningitis may present as a complication in the course of or together with obvious suppuration in the neighbourhood such as mastoiditis or sinusitis. On the other hand, advice may be sought for a patient with manifest meningitis, and the infective focus, hitherto overlooked, is discovered only during routine examination. In either event the patient's chances are determined mainly by the promptitude with which the condition is recognized and treatment instituted. It is impossible to decide on clinical grounds alone that he is beyond the reach of help unless quite literally at his last gasp—coma, head-retraction, and a purulent lumbar puncture fluid containing living streptococci are not incompatible with complete recovery. But it is obvious that once septic meningitis is present, nay, is even threatened, the prognosis becomes hourly worse. All septic meningitis starts as a local process, and in certain situations extension may be relatively slow. The condition sometimes described as "serous meningitis," or *méningite de voisinage*, represents an early stage of generalized suppurative meningitis, towards which, in the absence of treatment, it steadily progresses. It is true that rarely a subdural collection will remain localized for a considerable time, but these infrequent cases present the clinical features of and demand the treatment appropriate to brain abscess, and with these we are not now concerned.

CLINICAL FEATURES

Early Stage—The classical signs of meningitis are those of the later stages. Since early recognition is so

important, it may be useful briefly to review the clinical features of the initial phases. The patient with threatened or early septic meningitis is apt to be worried and anxious, to lose appetite, to feel vaguely ill, and looks "drawn." Onset is marked by headache, often vomiting, and a rise of temperature to 100-102° F, a rigor is rare. In infants the fontanelle bulges, and convulsions may occur. Development of symptoms is rapid. Pulse and respiration rates rise with the temperature. The headache is severe and unceasing with periodic exacerbations, quite at the beginning it may keep the patient awake all night. Definitely localized tenderness on percussion may be discovered. The mental state is clear and the patient may even walk about and transact business for a day or two. Symptoms and signs of the original disease tend to mask those of meningitis; but headache (as distinct from earache) that keeps the patient awake is not due to uncomplicated otitis media. When the disease affects only the meninges of the cerebrum there are no ocular abnormalities, no rigidity of the neck, no head-retraction. Though under increased tension the lumbar puncture fluid may appear macroscopically normal. With meningitis of the base or of the posterior fossa the pain is at first occipital, later frontal. Photophobia and rigidity of the neck (not head-retraction) may be early signs, and the lumbar puncture fluid is opalescent or turbid.

Later Stages —As the disease progresses the mental state may show some alteration; delirium at night is not infrequent. The patient tends to become drowsy, and when roused is irritable. When the frontal lobe is affected there may be a curious false optimism, though manifestly very ill he maintains that "I'm all right." The headache is still more severe so that a child or sometimes even an adult screams continuously. Neck rigidity is well marked and Kernig's sign present, but the deep reflexes are not affected. There may be

some inco-ordination of speech or movement, but paralysis is rare, except affecting the rectus externus oculi. The pupils may be small but otherwise normal, as is the fundus, photophobia is more pronounced. The temperature is irregular with a tendency to rise. Retention of urine may occur. The lumbar puncture fluid shows definite changes.

The patient is forced to bed even though he has hitherto battled with his troubles. He tends to be stuporose, but complains less of pain. Memory and power of thought may be affected. Inco-ordination is more marked, changes appear in the deep reflexes, and there may be recurrent vomiting. Head retraction, papilloedema, coma, paralysis, and incontinence are evidence of advanced meningitis, while the appearance of living organisms in the cerebro-spinal fluid indicates the breakdown of the defences. Hyperpyrexia or sudden respiratory failure may herald the end.

Lumbar Puncture — This procedure is of the greatest value in diagnosis. Not more than 20 c cm should be taken at the first puncture, and it is better to take less. Note the tension, and opalescence or turbidity, and put aside two or three c cm to stand in case a fibrin web forms. Often it is necessary to make the diagnosis on these observations alone. If the services of a pathologist are available *without delay* the most useful examinations are the cell-count, differential count, and estimation of chlorides. The result of culture is of value only in prognosis, while that of animal inoculation is of merely academic interest. A summary of the findings most useful to the clinician is appended (p 665).

DIAGNOSIS

This must depend on the clinical signs enumerated above, and the results of the puncture. The most important matter is to make a diagnosis without delay, in order that treatment may be begun. In any

case of doubt if the clinical signs suggest meningitis it is safer to assume that diagnosis for the purpose of treatment. Differential diagnosis must be made from other forms of meningitis, meningismus, encephalitis, brain abscess, influenza (especially "gastric"), typhoid, typhus, yellow fever, tick fever, drugs, and conditions mentioned under "Cerebro-spinal Fluid," p 672. Labyrinthitis begins suddenly with severe vertigo, and tends to improve, brain abscess begins less suddenly, following which there is a period of remission of symptoms, before signs of pressure appear, evolution is a matter of some days or a week or two, meningitis begins suddenly, and gets steadily worse, evolution is a matter of hours or a day or two. Hæmorrhage into the posterior fossa of the skull may produce fever, headache, head-retraction and (permanent) changes in the labyrinthine reflexes.

TREATMENT

The one important feature is the thorough surgical treatment of the cause, and (excluding trauma) this is usually otitis media, sometimes sinusitis. Without this other methods may delay but cannot alter the inevitable issue. There should be no delay beyond the bare minimum necessary to make preparations for the operation. The exact scope of the latter must depend on the causative condition, and is indicated in the case reports. On the question of opening the meninges, my own feeling is that heroic operative measures are rarely justifiable. The meninges have considerable recuperative powers, and unless overwhelmed by a massive infection will often win the day. In a few late cases it may be advisable to drain the internal auditory meatus. I believe that the attempt to disinfect the meninges by the introduction of drugs is likely to do harm, but is never beneficial. When the case presents as one of meningitis a thorough and systematic examination should be made of the

ears, nose and sinuses for any possible source of infection. The most likely to be overlooked is sphenoidal sinusitis; in a recent series of 19 cases of unexplained meningitis, 16 were due to this condition. One may have to seize the slightest indication of infection as a guide in treatment, as in Cases 4 and 5 below; if sometimes one is led to perform a mastoid operation on a child with tuberculous meningitis, little real harm has been done.

Other forms of treatment must be regarded as accessory to operation. Of these the most valuable is lumbar puncture, which may be repeated daily, drawing off enough fluid to restore the tension to normal. An intravenous injection of 20 c cm. of 1/2000 colloidal silver, or 5 c.cm of 1 per cent. mercurochrome may immediately precede the puncture. The intravenous injection of 10 c cm of 10 per cent. saline is said to be beneficial. Urotropine may be given by the mouth, provided the urine is or can be rendered alkaline, in doses of $\frac{1}{2}$ drachm every four hours. Bacteriophage may prove itself worthy of confidence. None of my patients who recovered were treated by any of these methods.

CASE SUMMARY

Excluding meningococcal infections, 19 patients have come under my care during the last six years suffering from meningitis. They form a continuous series, and are not selected in any way. Even when the situation seemed hopeless the patient was afforded whatever chance an operation offered. Tuberculous meningitis was diagnosed in two cases, and no operation was performed; in one case of tuberculous meningitis and one of pneumococcal origin, an operation was performed—the local indications were very slight. Cases 4 and 5 show how slight they may be in a case of otogenous meningitis. One case of tuberculous and one of pneumococcal meningitis had no local

otitis media, and were operated on without success. The latter of these survived 32 days from the operation, he developed nystagmus, with complete bilateral paralysis of VIII and VI nerves due to intracranial involvement in the meningeal suppuration¹ without labyrinthitis. In a seventh patient a Schwartz operation had been performed, for apparently uncomplicated mastoiditis, three days before I saw him with symptoms of gross meningitis, this case is excluded from the series below as being post-operative and probably traumatic. The only feature interesting in these cases (confirmed at autopsy) is the report on the cerebro-spinal fluid, as follows —

Case A—Tuberculous meningitis, mastoid operation, death Age 4 For several days drowsy and vomiting, facial paralysis, cerebro-spinal fluid under great tension, clear, depositing typical web on standing, "cells 25 per c mm, 40 per cent polymorphs"

Case B—Pneumococcal meningitis, mastoid operation, death Age 9 Meningitis, right ear-ache, ear apparently normal. Fluid purulent under pressure, "occasional gram positive cocci" (pneumo cocci grew later), mastoid normal

*Case C*²—Tuberculous meningitis, chronic otitis media, mastoid operation, death Age 12 Obvious meningitis, mastoid tenderness, fluid under normal tension and clear, "30 cells per c mm, 75 per cent lymphocytes, suggests tubercle"

Case D—Pneumococcal meningitis, chronic mastoiditis, operation, death Age 14 Ear-ache followed a cold, then meningitis. Fluid under great pressure and opalescent, "many polymorph pus cells" (pneumococci grown later)

Case E—Acute mastoiditis, Schwartz operation, meningitis, operation, death Age 5 weeks Fluid under high tension, cloudy, "many pus cells and streptococci", death three days later, autopsy refused

These cases are noticed here in order to emphasize the great importance of deciding at once to operate, without waiting for the report if to do so would entail a delay of some hours. Thus to wait might save a useless operation, but on the other hand might sacrifice the patient's only chance.

The remaining 12 cases form the series reported below of septic meningitis. The treatment adopted is indicated in the following table, with the result, and

the influence of duration on prognosis.—

Operation	Recovery	Death	Total	Duration of Symptoms of Meningitis		
				Under 3 Days	3 Days or over	
				Recovery	Recovery	Death
Radical mastoid	3	2	5	Nos 1, 5	No 4	Nos. 2, 3
Radical mastoid and labyrinthectomy	3		3	Nos 6, 7	No 8	
Radical mastoid and opening saccus endolymphaticus abscess	1		1	No 9		
Radical mastoid and drainage of cisterna pontis	1	1	2		No 10	No 11
Frontal sinus drainage . . .		1	1			No 12
	8	4	12	5	3	4

PROGNOSIS

Provided treatment is prompt this is by no means desperate even in well-established meningitis, though few cases recover in which living streptococci are found in the cerebro-spinal fluid. The duration of the disease exerts an important influence, well shown in the table; five patients had had symptoms of meningitis for less than three days, and all recovered; while among the seven in whom such symptoms had been present for three days or over, four died. The type of infection and the patient's resistance to it appear of more importance than actual severity of symptoms; cases 2, 11, and 12 presented when first seen the least conspicuous evidence of meningitis—all died. It is of course, arguable that other cases of this type were treated during the six years and recovered without ever being diagnosed as meningitis.

SUMMARY

The clinical features of septic meningitis, especially the early manifestations, are reviewed, with the accompanying changes in the cerebro-spinal fluid. Treatment must be prompt, and should comprise thorough surgical removal of the source of the infection, with lumbar puncture, other forms of treatment

are accessory. Heroic operations are deprecated. Even advanced meningitis may respond to treatment. The prognosis is moderately good. Histories are given of 12 cases of septic meningitis with eight recoveries

I am indebted to Dr. A. D. Fraser for the pathological reports cited.

Case 1—Chronic mastoiditis, meningitis, radical mastoid operation, recovery

F B, age 8, was admitted to the Bristol Royal Infirmary under Dr Clarke as tuberculous meningitis on March 3, 1926, the diagnosis appeared probable, the symptoms being headache, vomiting, and fever of sudden and recent onset. He was drowsy, screaming when roused, resistant, head retraction was noted, and Kernig's sign was present. The right ear had run for 5 years, but there was no trace of evidence of recent exacerbation. Lumbar puncture yielded opalescent fluid under pressure, containing 30 cells per c mm, 60 per cent polymorphs. Radical mastoid operation revealed a cholesteatoma that had eroded into the middle fossa, exposing the dura, recovery was uneventful

Case 2—Chronic mastoiditis, meningitis, radical mastoid operation, death

A E B, age 30, was sent to me on June 2, 1929, complaining of severe pain in the left ear, with left supra-orbital headache and tenderness. He had for years had discharge from the ear, occasionally offensive, quite recently profuse and thick, two months previously he had had influenza, and had not been well since, but there had been no aural signs until three days before. He looked really very ill, and staggered on walking, there was slight nystagmus on looking to the left. Temperature 100° F. The left meatus was blocked by a polypus, and pus exuded. He heard a watch, and Weber's test was referred to the left ear, there was no swelling present, but some tenderness above the ear, not behind. A radical mastoid operation was performed, revealing a large cholesteatomatous mass that had expanded the aditus and attic into a considerable cavity, exposing the dura, which seemed healthy. On recovering from the anæsthetic he was delirious, and a male attendant was required. He slept moderately, but next day was still in extreme pain, referred now to the lower jaw where he had a carious molar. It was clearly not the pain of mastoiditis. Photophobia was observed from now onward. On the second day (4th) there was still severe pain, especially now in the forehead, at times excruciating. Nystagmus to the left was observed, stopped and reversed by cold lotion in the cavity, on looking to the left there was nystagmus to the right. Vertigo and vomiting were troublesome, the wound clean, mentally he seemed clear.

Next morning at 2 a.m. he developed left facial paralysis, was shrieking with headache and was delirious, head retraction occurred later, and at 7 a.m. he died, apparently from sudden respiratory

failure At autopsy we found old-standing meningitis of the base of the forebrain, midbrain and cerebellum, symmetrical, with purulent fluid in spinal canal and ventricles The operation area was quite healthy, and there was no labyrinthitis The fluid grew a hæmolytic streptococcus On review it was clear that the original symptoms were due to meningitis, and the aural disease, though possibly the starting point, did not account for them, I was misled in my diagnosis by the mental clearness, but should in any event have advised operative treatment

Case 3—Chronic suppurative otitis media, meningitis, radical mastoid operation, death

R T, age 52, was brought to me on February 14, 1930, with the story that he had had great pain in the left ear for three weeks, and for 14 days had been light-headed and very ill, for a week he had been falling about and the speech had been blurred He looked moribund, temperature 102° F, pulse rate 60 feeble, respirations 44 He appeared not to appreciate his surroundings, seemed quite deaf, or stuporous, but rubbed the left mastoid and temporal region at times The right side of the face was paralysed, and the right arm spastic Head retraction was not found, although the neck was rigid and Kernig's sign present The knee jerks were normal, the plantar reflexes flexor on both sides, the pupils normal, but it was not possible to test for diplopia, a fine mixed nystagmus to the left was present Both ears had been running and deaf "all his life", there was no œdema or obvious tenderness, the caloric test was positive on both sides Lumbar puncture yielded turbid fluid under high pressure, reported "purulent C.S.F., the cells are polymorphs, no organisms seen, culture sterile" A left radical mastoid operation was performed, releasing a stinking cholesteatomatous mass, but the dura appeared healthy even where exposed by the disease He did not improve and died early on the second day after operation, the temperature rising to 105° , no autopsy allowed. Clearly a case of meningitis of the left temporal region, extending downwards

Case 4—Acute otitis media, meningitis, radical mastoid operation, recovery

E W, age 5, had had ear-ache on several occasions, nothing severe, never otorrhœa In December, 1930, after measles, he had transient bilateral ear-ache, but this passed and he returned to school in the New Year On January 19 he was feverish and again had slight ear-ache, on January 25 he vomited, and this was repeated during the following days; on January 29 he vomited four times and began to complain of headache On the 31st his temperature was 101° F, there was headache, head retraction, and photophobia He was brought to me on February 2 with T 102.4° F, Kernig's sign was present, with well marked neck rigidity, the headache and vomiting had ceased following lumbar puncture on the 1st The child was drowsy, cried continuously when roused, and tended to relapse soon, the knee jerks were absent, the other reflexes normal. There was no nystagmus nor ataxia Lumbar puncture had yielded fluid under high pressure, turbid, the report on it was "Cells 100 per c.mm 40 per cent polymorphs,

very many streptococci in smears" The right ear showed some retraction of a rather dusky membrane, certainly no trace of swelling or redness anywhere At one point near the apex of the mastoid there was a definite but really quite slight tenderness The local signs were so vague that by themselves they would not have justified a diagnosis of mastoid disease, but since the meningitis was definite I advised operation

A radical mastoid operation was accordingly carried out forthwith, there was no pus in the tympanum and the antrum was quite normal, at the apex of the process and posteriorly over the lateral sinus was some congestion and sero-purulent fluid in the cells, and again in the deep cells above the external semicircular canal The lateral sinus appeared normal, the dura was freely exposed in both middle and posterior fossæ Culture of the bone chips from the suspicious part of the mastoid grew streptococci The temperature fell to normal in four days, the mental state improved greatly after one week, and convalescence was uneventful

Case 5—Recurrent otitis media, meningitis, radical mastoid operation, recovery

H E, age three, was brought to me on February 10, 1931, with meningitis of two days' duration He had had suppurative otitis media of both sides a year previously and again following pertussis in December, 1930, of short duration In January, 1931, he had measles On examination he was very drowsy, going to sleep at once if left alone, when roused he screamed continuously, was not deaf, but would not answer questions There was head retraction, Kernig's sign was doubtful, the plantar reflexes were flexor, the pupils were normal, there was no paralysis, but he would lie only on the left side No tenderness, no œdema, doubtful evidence of pain in the left ear, which appeared normal Temperature was 101° F, pulse 140 Lumbar puncture gave fluid under great pressure, but too much contaminated with blood for examination and sterile on culture Left radical mastoid operation performed with exposure of the dura The latter seemed normal, but the antrum was full of creamy pus with many cocci—this also was "sterile" on culture For several days he remained very ill, with symptoms of meningitis and high fever, then began to improve and made a complete recovery

Case 6—Chronic mastoiditis, meningitis, radical mastoid operation with labyrinthectomy, recovery

A S, age 37, had had left otorrhœa many years, three weeks previously (1926) vomiting, headache, general malaise temperature 103°, drowsy, confused, very severe frontal headache, and temporal pain, no vertigo, no swelling, no tenderness, labyrinth "dead" Lumbar puncture yielded fluid under considerable pressure, not examined histologically Operation showed gross disease of the labyrinth, recovery uneventful

Case 7—Chronic mastoiditis, labyrinthitis, meningitis, labyrinthectomy, recovery

Miss G F, age 24, had had suppurative otitis media four years previously, and the right ear had been painful and discharging for one week (June 17, 1930) Early on the day I saw her she had

complained of severe frontal headache, with photophobia, and was noticed to have spontaneous nystagmus to the left. No history of vertigo or vomiting was obtained, but the history as a whole was very meagre. During the afternoon she had been feverish, delirious and violent. When I saw her the temperature was 99° F, pulse rate 88, she could lie in bed in any position, and was groaning with the headache, but made no sign that she heard any questions, and appeared semi-comatose. There was definite head-retraction, but no Kernig's sign, the knee jerks were brisk, the left plantar reflex was extensor. The pupils were equal and reacted to light, the fundi normal, there was no nystagmus (too little conscious?) nor manifest ocular paresis, but the eyes were noted not to be turned to the left, i.e. they were deviated to the right. No paresis of face, arms or legs. The right ear was freely discharging pus, granulations hid the fundus, the latter was very tender, but there was no tenderness nor oedema outside. She was too ill for tuning-fork or vestibular tests. Lumbar puncture yielded a fluid under considerably raised tension and turbid, the report (next day) was "Many pus cells and occasional streptococcus", a trace of sugar was found in the urine.

A radical mastoid operation was carried out forthwith, with free exposure of the dura in both fossæ. The mastoid was acellular, full of pus (later reported streptococcal), there was no sign of either incus or stapes, and a cavity led down among the canals so that the labyrinth was exposed both in front and behind. A labyrinthectomy was carried out, but it was decided not to open the dura. During the following days lumbar puncture was repeated, the fluid becoming clear on the fourth day, recovery was uneventful, and she is to-day well.

Case 8—Chronic suppurative otitis media, labyrinthitis, meningitis, operation, labyrinthectomy, recovery.

Gilbert T, age 14, was brought to me on September 1, 1930, complaining of very severe—at times agonizing—frontal headache, and pain in the back and legs. The temperature was 100.4° F, pulse 56. The illness had started a week previously with vomiting and intense vertigo followed by pain in the right ear. The ear had been running for years, the meatus was occupied by a polypus, and it was completely deaf to all tests, no swelling was found, but one point rather behind the mastoid was tender. He showed spontaneous mixed nystagmus to the left, coarse and irregular, worse on looking to the left. The pupils and fundi were normal. There was no response to the caloric test of the labyrinth, but Barany's fistula test was positive. Head retraction was well marked, Kernig's sign positive, the knee jerks were present, the plantar reflexes absent, no paresis or inco-ordination. The mental state was clear. Lumbar puncture yielded fluid under high pressure and quite turbid, reported "many pus cells, glucose absent". A radical mastoid operation was therefore carried out with labyrinthectomy, the middle ear was filled with a cholesteatoma, all the ossicles being absent, the vestibule full of pus. Lumbar puncture next day gave fluid under high, but less, tension, turbid, and reported "Cells 80 per c.mm., 60 per cent polymorphs, glucose 0.065 per cent, culture sterile". The

probably had meningitis of the temporo-sphenoidal lobe from infection *via* the tegmen several days before she came under care

Case 12—Frontal sinusitis, meningitis, operation, death

G T, age 23, was brought to me on February 19, 1931, with a story of shooting pain in the middle of the forehead for 5 days, and swelling for 4 days, after influenza, during the last day he had been sweating, shivering and vomiting. Temperature 100.8°F . The frontal pain was very severe and there was also pain in the nape of the neck, but no head retraction, Kernig's sign negative. Photophobia was prominent, the pupils normal. A brownish offensive discharge flowed from both nostrils. Lumbar puncture yielded fluid under very high pressure and cloudy, reported "pus cells and streptococci" but not cultured. Double external frontal sinus drainage was carried out, both sinuses being full of stinking streptococcal pus. He became comatose two days later, the temperature rose to 107°F and he sank and died, without exhibiting any head retraction. At autopsy we found purulent meningitis confined to the vertex and anterior part of the right frontal lobe.

THE CEREBRO-SPINAL FLUID

Only conditions associated with acute brain or meningeal symptoms are considered, excluding hæmorrhage, uræmia, diabetes, pneumonia, endocarditis.

Pressure Normal 100–150 mm of fluid = not more than two drops per second from the needle.

*Slight Increase, not more than
Twice Normal*

Great Increase

Straining, stertor, meningismus, encephalitis, early abscess, acute syphilitic or early septic meningitis	All other meningitis, brain abscess or tumour
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Appearance · Normal = water clear, also in meningismus, encephalitis (non-suppurative).

Clear, or Faint Opalescence

Turbid

Brain (extra- or sub-dural) abscess, Local or early septic meningitis Typhoid fever Tuberculous, acute syphilitic or early meningococcal meningitis, with these a fine fibrin conglum may appear on standing	Septic or meningococcal meningitis, leaking abscess 500 lymphocytes per c mm may produce only the faintest opalescence 200 polymorphs usually impart definite turbidity
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Cells . Normal 0–4 per c mm, all mononuclear Any

variation may occur with brain abscess, the typical count being 10-30 cells per c.mm. of which 10-30 per cent. are polymorphs.

Mononuclear 5-50 per c mm	Polymorphs 10-70 per cent 10-500 per c mm	Polymorphs 70-90 per cent 100-5000 per c mm
Tubercle, syphilis of C.N.S., tumour, encephalitis, poliomyelitis, polyneuritis, herpes, malaria, parotitis, pertussis	Early tuberculous, acute syphilitic or local or early septic meningitis, influenza (rare)	Meningitis, septic, meningococcal, influenza, leaking brain abscess

Protein · Normal 0.025 per cent ; usually increased with cell increase.

Blood · *Uniform* staining in hæmorrhage, encephalitis

Bacteria . In typhoid may be numerous and grow on culture; in meningococcal meningitis very few at first, gram-negative and intracellular; tubercle bacilli may be very hard to find. Coliform, diphtheroid, Pfeiffer etc., may occur. Streptococci, staphylococci, and pneumococci are Gram-positive and mainly extracellular, if numerous, and they grow on culture, or if the cells are few, the prognosis is bad. A turbid fluid containing numerous dead bacteria and cells, with normal chloride and phosphate but no glucose, suggests a leaking brain abscess. Even with a turbid fluid a sterile result on culture is auspicious.

Wassermann reaction . A positive Wassermann reaction may be due to (non-syphilitic) disintegration of brain tissue

Glucose · Normal 0.045-0.08 per cent.

Slight Increase	Diminished	Absent
Encephalitis (non-suppurative) brain abscess	Tuberculous or early septic meningitis	Meningococcal or septic meningitis, leaking abscess

Chlorides . Normal 0.72-0.75 per cent., brain abscess,

meningismus. Diminished in meningitis, down to 0·65 per cent. or less, anything below 0·68 per cent. of bad omen; below 0·6 per cent. only in tuberculous meningitis. Attach no significance to diminution in typhoid or pneumonia.

Phosphates: Normal up to 0·002 per cent.; above 0·0025 per cent. only in *generalized* meningitis, all varieties. Increase of phosphates with diminution of chlorides indicates generalized meningitis, even though the fluid is clear.

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The Psychogenic Aspect of Dermatology

By MARY HORAN, B.A., M.B., B.Ch.

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THE old French dictum that the skin is the mirror of the mind has always had its advocates on the Continent, and the French school has, especially of late, emphasized the tropho-neurotic theory and consider it to be proved that the skin readily expresses its vascular response to emotions and to suggestions. In this country we freely acknowledge and diagnose functional dyspepsia, functional pains, and functional arrhythmia of heart, but in dermatology alone the nervous factor has been either ignored or else under-estimated. Yet the hysterical origin of the stigmata of the saints and mystics has long been recognized by physicians, and it is well known that erythema and blistering of the skin can be produced by suggestion under hypnosis, as, for instance, by touching the skin with a cold pencil and telling the hypnotized patient he is being touched with a red-hot point. Caparède cures cases of urticaria and hay fever by suggestion in one seance; Kohstamm could by suggestion obtain the formation of bullæ in fifteen minutes; and Mohr and Krebig have produced urticarial rashes at will. Bloch, in Zurich, has lately successfully treated warts by suggestion therapy and claims to obtain 50 per cent. cures in verrucæ vulgares, and as much as 80 per cent. in verrucæ planæ. It is considered by some that by suggestion the blood-pressure is lowered, thereby diminishing the amount of blood going to the skin and thus producing atrophy of the papillomata.

Oppenheim has recorded cases of angio-neurotic œdema occurring jointly with hysteria, exophthalmic

goitre and urticaria. When in Vienna I was impressed by the frequency the neurotic element was present and noted in cases presenting themselves in the Arzt Clinic. Oppenheim considers anæsthesia of the palate to be one of the most important diagnostic signs of hysteria, although the other stigmata, i.e. excitability, tremor, exaggerated reflexes and anæsthesia of the sclerotics must also be looked for.

Eller, in America, has recorded cases in which extreme emotional shock has been the precipitating factor in dermatitis herpetiformis and psoriasis, while Weyl regards psoriasis as evidence of the congenital weakness of the nerve centre regulating the functions of the skin.

The purpose of this article is to insist that the emotions, acting through the endocrine and circulatory systems, can and do bring about many pathological conditions of the skin. That the same pathological conditions may be produced by other causes is admitted, for throughout the entire realm of medicine we know the same diseases may be produced by different morbid factors acting singly or in combination. So also a tic or habit may localize a disease as in cases of right or left sided acne of face in a student who habitually rests his chin in his hand with the palm and fingers covering one side of the face and neck.

Skin conditions in which the psychic element is found may be divided into two classes: (a) the first includes the skin phenomena in which the psychic element is the only causative factor, and (b) the second and larger class which includes all those skin diseases long recognized as being partly nervous in origin.

Class 1. Conditions caused exclusively by psychic disturbances—Some may consider that these cases belong more to the domain of the alienist than that of the dermatologist. The dermatologist, however, is usually consulted in these cases.

This class includes the well-known phenomena of

sudden pallor produced by fright or other intense emotion, blushing, horripilation, i.e. nervous erection of hairs, cutis anserina or goose flesh, nervous sweating; trichotillomania, i.e. plucking out of hairs with intention to deceive; nervous incrimination, i.e. uncontrollable desire to scratch or rub with subsequent plucking of hairs with no intention of deceiving, erythrophobia in which there is great dread of blushing and in which red patches with sharply defined edges appear on the neck, chest and face, parasitophobia, i.e. fear of parasites in the skin; dermatophobia, i.e. fear of skin diseases; dermatalgia, i.e. neuralgia of the skin, cancerophobia, i.e. red burning tongue coupled with fear of cancer. In this class must also be placed the pigmentary changes due to psychic or neurogenic disturbances, i.e. vitiligo, chloasma, sudden canities of hair, as instanced by the historical case of Marie Antoinette's hair becoming blanched within the last few days before her execution. Kaposi and Hebra have recorded cases in which under great emotional stress hair has turned white overnight.

I have intentionally delayed mentioning the most striking type of case included in this first class. That is the condition known as dermatitis autophytica in which the patient presents to the physician self-inflicted injuries of skin. It may be conveniently divided into three separate types. The first type shows scratched and excoriated patches of skin caused by nervous picking and scratching an eruption already present or supposed to be present. These cases have no intention to deceive and are generally the elderly type of neurotic who is intensely self-centred and who derives a large amount of satisfaction from their bodily ailments. The second type shows injuries inflicted in neurotic or hysterical states with or without conscious desire to elicit sympathy and with a morbid craving for attention. They are generally young girls. The third type chiefly occurs in elder people who produce self-inflicted injuries of skin in order to escape

from uncongenial work or else to gain compensation from their employers. The strange beings who constitute the second type are chiefly hysterical young women who show signs of an exaggerated self-centred egotism which supports O'Donovan's theory that the cause of an artefact in young people is almost invariably an unsuppressed dramatic instinct. A certain proportion of these patients, however, show no signs of mental deterioration, but Norman Walker states that every one of the cases under his care has shown marked anæsthesia of the palate. The patients have a definite facies; they are either nervous and restless or else more commonly they have a peculiarly placid innocent mien which conceals their inwardly tense frame of mind. They also display great interest and satisfaction in their condition, which, together with a certain amount of exhibitionism and attitudinizing, help in the diagnosis.

The eruption is generally linear or rectangular, is unlike that found in any other condition, is essentially destructive showing denudation and gangrene, is surrounded by perfectly healthy tissue from which it is sharply demarcated and is generally on some part of the body accessible to the patient's right hand. Sometimes linear extensions of the injuries are to be seen where the causative fluid—for alkalis and acids are commonly the agents used—have dribbled down. The patients themselves preserve a dove-like air of innocence which never breaks down under any cross-examination, and they always strenuously deny any knowledge of the origin of their troubles. Norman Walker says. "Such patients must be stripped stark naked, they must be left without even a handkerchief to weep into, and put into a bath, while their room and belongings are searched with a thoroughness of a Sherlock Holmes." It is not always possible to follow out completely this excellent precept, but an occlusive dressing sealed down with collodion with

adhesive plasters or an Unna's dressing must be applied and attention paid to the patient's general health and serenity of mind. In many cases thus treated the original patches heal up quickly but a fresh eruption will appear just above the dressing.

The following are brief notes of two cases treated at the London Hospital.—

Case 1—A girl, aged 17, attended the London Hospital with numerous ulcers on the left arm and with a follicular eruption of the face. The nails were stained yellow. There was no œdema.



FIG 1—Case 1. Trichotillomania.

She had attended hospital twice before for a similar condition and on each occasion had been discharged cured. This time she was treated as an in-patient with occlusive dressings and discharged cured within the month.

Case 2—Woman, aged 44, an educated, intelligent woman, highly respected in the school where she teaches. The stigmata of hysteria were elicited. She first attended the London Hospital in 1926 with a tuberculous dactylitis of the right third finger and had been treated in her home town for the condition. X-ray examination did not show any bony change. She was treated with the Krohmayer lamp and was discharged cured in 1927. In 1928 she returned to the London Hospital with a clean fissure of

the right ring finger with some scaling of the proximal joint of the finger. She was treated with X-rays, ultra-violet light, and occlusive dressings and soon healing at each edge was seen. But some time later a small blister appeared above the linear fissure and she is at present attending the hospital with this condition. Multiple types of occlusive dressings have been devised, including even a tin-foil covering. It was punctured, a tiny streak of blood just marking the minute puncture. She is still attending the hospital for the condition in the intervals of discharging her teaching duties at her school.

Class 2. Cases in which the psychic element is found but not necessarily the only causative factor.—In this class must be placed many cases of pruritus, acne rosacea, varicose ulcer, lichen planus, dermatitis herpiformis, urticaria, alopecia areata, cheilopompholyx, psoriasis, lichen simplex of Vidal, and many of the so-called chronic eczemas.

The increasing literature on the subject of alopecia areata shows that while the factors of focal sepsis and endocrine disturbances, particularly that of the thyroid, as suggested by the recent use of thallium, are important, still more important are psychic disturbances and mental strain as causative factors in this disease. As in other branches of disease the same skin condition may be produced by different morbid factors acting singly or in combination. The following cases I have treated at St. Paul's Hospital illustrate the nervous factor in this disease.—

Case 3—Woman, aged 43, married, with five children, came to hospital with confluent alopecia areata. A thin, restless, worn woman, she gave a history of having had complete loss of hair in 1921. One of her children had been burned to death in 1915 and she subsequently had had a nervous breakdown. Then followed the air raids, and her "nerves had been very bad since." When she came to the hospital for treatment the body hair had grown and the marginal growth of the scalp was good. She made good steady progress with a treatment consisting of linimentum saponis locally and a bromide mixture internally. But a few months later she had a relapse. Her mother was dying and she developed a stutter and complained of vague pains shooting through her and later had an attack of cheilopompholyx. She complained that her nerves were very bad after her mother's death and that she was having fits of depression and crying. She was very restless, saying she always wanted to run or jump or scream and that she often felt something jumping within her. Her expression became

peculiarly restless and startled. She is, however, making good progress again with light baths and sedative mixtures.

Case 4—Peggy D, aged 6, was brought to me at St Paul's Hospital with two bald patches about the size of a two-shilling piece, one on the vertex and the other behind the left ear. She was a thin, peevish looking, precocious child, and was described by her mother as being "jumpy and nervy." She had frequently night terrors, grinding her teeth in sleep, and was afraid to be alone. Complete regrowth of hair followed treatment consisting of ultra-violet light baths, tonics, and a stimulating lotion for the scalp.

Another disease which often shows a neurotic origin is cheiopompholyx. Cheiopompholyx is a scaly, vesicular, irritating eruption of the hands found in nervous individuals often when undergoing unusual strain. It is too often erroneously, and rapidly, diagnosed as "trade dermatitis" or chronic eczema of the hands. O'Donovan regards cheiopompholyx as a "pattern reaction" to a variety of etiological agents in individuals with a predisposition owing to chance or hereditary. The following are notes of two cases at present attending St. Paul's Hospital with the condition.—

Case 5—C R, aged 42, attended out-patients at St Paul's with a typical condition of cheiopompholyx of three months' duration. When I saw this patient he was trembling and shaking and showing great signs of distress as he had just seen an intravenous injection administered to another patient—"a horrible sight." He had been shell shocked in the war and he said that ever since his skin "bursts out with any worry." He was unable to stand worry of any sort and suffered from a mild degree of claustrophobia, being unable to travel inside a bus, tram or train, for a long journey. He told me his hands always erupted when his wife worried him. He made good progress with administration of luminal (tablets) gr $\frac{1}{2}$, twice daily, and locally unguentum zinci and unguentum lanoline co. But two months later he had a severe relapse. He had had domestic worries.

Case 6—Clara C, aged 18, came to St Paul's Hospital for treatment for a moist vesicular eruption on her fingers. She did domestic work. She complained of sleeplessness owing to the intense itching of the eruption. She was a thin nervous girl with a tense expression and was extremely loquacious. She told me she had always been exceptionally highly strung and nervous. Treatment consisted of X-ray (half S.B.) to the fingers withunction of unguentum emolliens and a 1 gr luminal tablet at night. She was well at the end of a month.

[The psychic element in many cases of urticaria is

constant friction and rubbing. The following cases illustrate this :—

Case 9—A labourer, aged 60, attended the London Hospital with an ulcer of the leg. He gave a history of having knocked his right ankle when he fell from a barge twenty years previously. The ulcer was covered with an occlusive dressing and rapidly healed. This despite the fact that according to the history the ulcer had never shown any signs of healing since the accident. A few months later he attended hospital with erythema of the right leg together with marginal pigmentation and lichenization. There was also an ill-defined erythema with abraded surface on the front of the left leg. The condition rapidly disappeared with the application of occlusive dressings.

Case 10—Male, aged 48, a costermonger by trade, presented himself at St. Paul's Hospital with an abraded scaling erythema of both forearms extending from the wrist to just below the elbows. The condition had existed for three weeks and had not been preceded by any injury. The patient was a thin worried looking man with a furrowed face and he gazed listlessly in front of him while he described his symptoms to me. He told me he had serious troubles and constant worries and that he had had a shock prior to the onset of the eruption, having been knocked down by a motor car. He made rapid improvement with a treatment consisting of applying malachite green to the forearms and a bromide mixture to take internally.

The nervous factor in lichen planus has been generally recognized. Lichen planus is a disease in which small flat papules appear on the flexor aspect of the wrist, shins, lower abdomen and inner aspects of the thighs and legs. The papules are intensely irritating and are generally of a violet lilac hue, but may also be bright red. The disease occurs chiefly in nervous people with hysterical stigmata, or in overworked people suffering from depression or shock. Whether the nervous disturbances are causative or whether they predispose to an infection is an open question. I lately saw in the out-patient department of the London Hospital a bus conductor whose bus had knocked down and killed a man the previous day. He had a typical lichen planus eruption on the forearms and hands.

It seems apparent that the modern strain of life is going to produce more and more nervous phenomena in all branches of disease, and so the practitioner must keep in mind the nervous factor as a possible

etiological cause in the cases of skin conditions presenting themselves for treatment.

It is by kind permission of Dr. W. J. O'Donovan that I have quoted the cases seen at the London Hospital and St Paul's Hospital.

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An Easy Way to take Raw Liver

By DONALD G FALCONER, M.B., CM

AS the treatment of certain diseases by the administration of liver is becoming more and more into prominence, and as the difficulty of getting patients to adopt or continue the treatment is well known, the following short description of the personal experience of one who has undergone the ordeal may be of interest to some readers.

Liver is not a very attractive food at any time, but when one is ordered to take it raw or "lightly cooked," then the trouble begins. Some time ago I determined to try this diet. I was advised to take half a pound daily, lightly cooked. My adviser also told me to get a copy of "Liver Diet," which, as he put it, would prove helpful. I procured my liver and my book and started on my course. I was never very fond of liver, and if I took it at all, I preferred it well grilled through. I tried one recipe then another; some I managed with difficulty and some I could not stand at all—at least not twice. Sometimes I got a concoction which was quite palatable, but here I judged that my wife, in the goodness of her heart, had rather overdone the "lightly" part of the business.

Being now reduced to a condition of only being able to take the stuff when I had lost faith in its having any virtue left, what was I going to do? Some time ago I remembered when obliged to take a course of rather nauseous medicine, I got over the difficulty by putting it into cachets, so I thought, why not treat the liver in a similar manner? I started off with medium-sized cachets and found the procedure quite practicable. It involved my having to swallow rather a large number

of cachets daily, however, and proved very tedious. I then wrote to my chemists and told them to send me a supply of the largest cachets they had in stock. They sent me Thos Christy & Co's No 3 size, and I found that these answered excellently. Now this, to my medical readers, may sound so simple as to be hardly worth recording, but when one thinks of the amount of ingenuity involved and time expended in trying to make the liver palatable, and the number of expensive extracts on the market, I am not sure that many of them have handed on the information to their patients.

Few patients know what cachets are, and very few how easily they can be filled and sealed. To most lay people the practice sounds one only to be undertaken by a member of the Pharmaceutical Society, with the aid of an elaborate machine. I can assure them that no skill is required and the process is simplicity itself. In practice it will be found that no sealing of the cachets is really required and that each one may be made to carry much more than its legitimate load.

I divide my half pound of liver roughly into three parts and take one portion about 11 a.m., another about 3 p.m., and the last any time before bedtime. Of course, every patient can alter the amounts or the times to suit himself. I find the larger cachets are not more difficult to swallow than the smaller ones, and I was always a poor swallower of pills. Personally I use hot water, as I think it makes everything easier. By taking one cachet and a sip of water in the mouth, and imitating the little birds by holding the head well back, I find that it slips down with the minimum of effort. I, of course, cut up the liver first, using a fork and sharp knife (it is advisable to keep a small knife-sharpener always handy), reducing it to a pulpy sort of mass and scraping away any ducts or stringy portions which may be present. I find it possible by this method to use tough and fibrous cows' liver which could not by any other method be rendered palatable.

When dealing with the livers of younger animals no such difficulty is, of course, encountered.

I claim that this way of taking the liver has the following distinct advantages —(1) All cooks, mincing-machines and cooking apparatus are entirely dispensed with, (2) the patient after one short demonstration by his doctor or nurse can carry out the whole process himself; (3) he will be able to see that his liver is always fresh and in good condition, and I find that this is *most* important, (4) the whole or any part of the ration can be taken raw and for an indefinite period with no fear of getting nauseated, (5) it is comparatively inexpensive, and this, I think, is also an important point; (6) cows' liver can be used and it is sometimes the only kind procurable

In conclusion, I would emphasize one point, and that is always to fill the cachets just when ready to swallow them. I always fill and swallow one before filling another. If left filled for any length of time they become soft and sodden and feel very disagreeable and may even come apart in the mouth, which, I can affirm, is distinctly unpleasant. This specially applies to cows' liver. I have never experienced any ill-effects from taking so many cachets. A peppermint or other lozenge may be taken afterwards by fastidious patients in case of any "repeating."

Practitioners who order their patients half a pound of liver a day may consider it a very small amount, but I can assure them that to the poor patient it is a question of "Oh, the little more and how much it is," and it is a truism that as a rule a sick man is not a hungry man. It may be that if all the liver is taken raw a smaller dose may suffice, but I have not experience enough to pronounce an opinion upon that.

An Etiological Classification of Anæmias

By R. E. HORSFALL, M.D.

CLASSIFICATION of facts is one of the fundamental principles of modern science, and in no branch is it of more importance than in medicine. The massive accumulation of data created by our research workers is daily growing more and more unwieldy and becoming an insupportable burden for our memories, and it is thus essential that efficient classifications should come to our aid by gathering together correlated facts, and epitomizing our knowledge in a useful form. It seems important that such tabulations should be not merely of academic interest, they should be arranged as far as possible to aid the clinician in solving his problems. They should be the keys with which he may unlock the doors of differential diagnosis.

The classification of anæmias is a difficult matter, and existing examples are notoriously inadequate. The difficulty of the problem becomes obvious when we consider the enormous number of causal factors, and our restricted knowledge of the forces controlling the hæmatopoietic function.

The division of anæmias into primary and secondary is not helpful, and is really a confession of ignorance. The following classification is based on etiological considerations, and it is suggested that this form may be of assistance to the physician confronted with the task of elucidating a case of anæmia.

I. LOSS OF BLOOD

(1) *Extra-vascular* (i.e. blood lost outside the vascular circuit) —

(A) Hæmorrhage, e.g. hæmaturia, menorrhagia,

hæmoptosis, hæmatemesis, melæna, trauma, ankylostomiasis.

(B) Purpura.

(C) Hæmophilia.

(2) *Intra-vascular* (i.e. blood destroyed inside the vascular circuit) :—

(A) Pernicious Anæmia—better called macrocytic anæmia, or achylic anæmia in the light of recent knowledge. This condition may equally well be grouped under II (1) E.

(B) Splenic anæmia.

(C) Banti's disease.

(D) Familial acholuric jaundice. (This may also be grouped under II (2) B)

(E) Infantile anæmia—a physiological process commencing after birth, which may become pathological in severity.

(F) Malaria.

II. DEFICIENT BLOOD FORMATION

(1) *Extra-vascular* :—

(A) Septicæmias, toxæmias, cachexias—e.g. syphilis, malignant disease, tuberculosis.

(B) Nephritis.

(C) Phthisis.

(D) Hyperlactation.

(E) Pernicious anæmia.

(F) Achlorhydric anæmia—in menopausal women, with a characteristic glossitis and dysphagia

(G) Diet deficiency—(1) Iron and copper (late infantile type); (2) vitamins—scurvy, beri-beri, and possibly von Jaksch's anæmia.

(H) Drugs—Mercury, lead, arsenic, salicylates, morphia, cocain.

(I) Subthyroidism

(J) Skin—lack of sunlight

(2) *Intra-vascular* —

(A) Aplastic anæmia—(1) Agranulocytic anæmia,

where both red and white cells are deficient; (2) agranulocytosis, where the granular white cells only are deficient.

(B) Familial acholuric jaundice.

(C) The leukæmias

(D) Chloroma

(E) Hodgkin's disease — lymphogranulomatosis maligna.

Although at first sight this list appears formidable, yet it will be observed that all these heterogeneous factors fall naturally into the two main groups of blood loss and deficient blood production, and that each of these is subdivided into extra-vascular and intra-vascular causes

If this table be memorized, the clinician can proceed more easily with his investigations. In an obscure case, these will include not only a thorough clinical examination, but may require some or all of the following specialized procedures:

(1) Complete blood examination —

(A) Red cells—total count; presence of immature cells, fragility; Price-Jones' curve; hæmoglobin; colour index.

(B) White cells—total and differential count, Arneth index; presence and count of immature cells.

(C) Plasma—clotting time; Van den Bergh's reaction, blood culture

(D) Platelets—total count

(2) Fractional test meal

(3) Stool examination for parasitic ova and occult blood

(4) Renal function tests.

(5) Histological examination of lymphatic gland

(6) Tuberculin skin reaction.

In conclusion, the elucidation of the personal and family history is as important in cases of anæmia as in other pathological conditions

Postural Nasal Obstruction

By E R GARNETT PASSE, M.R.C.S., L.R.C.P.

House Surgeon, Central London Throat, Nose and Ear Hospital

MANY patients complain that shortly after lying down they are unable to breathe through one or other nostril, and this is usually the side on which they are lying. On sitting up the obstruction disappears, and on changing sides the obstructed side changes also. With it the patient often complains of a post-nasal discharge causing a bout of hawking on rising.

This condition is due to erection by engorgement of the mucosa of the middle and part of the superior turbinates. Histologically the mucous membrane of this region is composed of a surface layer of ciliated columnar epithelium, supported by several layers of cubical cells lying on a basement membrane. This membrane is much thicker on the anterior and posterior ends of the concha and along its inferior border. In the middle cavernous layer are mucous glands, thin walled blood vessels and elastic tissue. This comprises the erectile layer. There is no erectile tissue in the superior turbinate, for here the character changes to that of olfactory. Erection of this mucosa is a purely normal physiological function on the part of the nose to raise the temperature of the air and to supply it with moisture through the glandular secretion.

Often, however, this swelling of the nasal mucosa is directly induced by an underlying pathological condition. The swelling in these cases is greater and causes more obstruction than it does in a normal nose. Sometimes one side of the nose is blocked and sometimes the other, the change being often quite sudden. Rarely does it affect both sides together.

Thus it may be a concomitant of hay fever and certain types of nasal asthma. Ethmoidal infection, chronic hypertrophic rhinitis and certain cases of abnormalities of the septum are also conditions often seen in these cases. The swelling may be induced by hot food and drink, entering or leaving a heated atmosphere where a sudden change of temperature is encountered. The condition is less common in dry climates. The nocturnal swelling is often worse in neurotic states and often disappears when their neuroses improves. That it should occur on the side on which the patient lies is possibly due to gravity and some slight compression of the venous return of the veins in the neck.

On examination during an attack, the mucosa appears pale and swollen. It pits on pressure, and regains its contour on release of the pressure. It completely disappears on spraying with 10 per cent. cocaine if hypertrophic rhinitis is not also present. The throat may show some congestion as the condition often causes some mouth breathing.

As regards treatment, any underlying disease must be treated. Plenty of fresh air, and avoidance of draughts and hot stuffy atmospheres is *sine quâ non*. Three or four drops of 10 per cent argyrol instilled night and morning is often very efficacious, and during the day the patient may use a spray of menthol grs. v, camphor grs. ii, in ʒi of liquid paraffin. Internally, calcium may be given, with pulv. peptoni bovini siccati grs. v. Failing this a more radical course is advocated. Fibrosis of the mucosa should be induced by means of the galvano-cautery or chromic or nitric acids. If the patient is a nasal asthmatic, as determined by the test advocated by H. M. Wharry (in which if the anterior surface of the septum or inferior turbinate be stroked with a probe and lachrymation is observed on the same side as the nasal fossa tested—normally there is no reaction), then much good may result from nasal ionization.

adopted for the immediate relief of convulsions, several old conventional procedures have their value. Following the trial that leads the family doctor from the doorstep to the seat of operations, the patient may often be found in a hot bath. One is filled with admiration for the sleight of hand with which many mothers can immerse a child with convulsions in a bath, but hot packs are equally effective and can be wrung out of mustard and water and applied with less disturbance to all concerned. Cold cloths may be applied to the head. An evacuation of the bowels by irrigating with saline solution is to be commended. Other irritants in addition to the familiar tomato may be removed and thus peace be promoted. For drug treatment chloral in solution delivered high in the bowel by means of a catheter in doses of 0.24 gram (four grains) at six months, 0.36 gram (six grains) at one year, and 0.48 gram (eight grains) for a child of two may be given, the drug being dissolved in thirty cubic centimetres (one ounce) of warm water or milk. In twenty or thirty minutes the effect should be evident. The inhalation of ether is invaluable in checking the continuance of an attack and may be followed by a prescription of chloral in 0.18 gram (three grain) doses for a child of twelve months. There is no advantage in administering chloroform rather than ether. A single hypodermic injection of morphine 2.6 milligrams (one twenty-fifth of a grain) to a robust child can be administered in place of ether inhalation. For convulsions that recur luminal is deservedly popular, bromides are as useful as ever, and phenazone is deserving of wider recognition. Stephen has used a ketogenic diet in but three cases of epilepsy. The results were not encouraging, but the cases were long established and very severe — (*Medical Journal of Australia*, August 22, 1931, xxxvi, 231)

Thrombo-phlebitis Migrans in Scarlet Fever.

J. B. Ellison discusses this rare complication, rarer now probably when the primary disease has become so much milder, than in the last century when most of the recorded cases occurred. Formerly it was usually due to direct spread of inflammation from suppurating glands, commonly in the neck. He describes two cases in boys of 6 and 10½ years with thrombo-phlebitis migrans, in which the lesions are disseminated in time and space, small lengths of superficial veins being usually first attacked, visceral phlebitis, commonly in the lungs or abdominal organs, may occur, but, although convalescence may be prolonged and relapses occur, the prognosis is usually favourable — (*British Journal of Children's Diseases*, 1931, xxviii, 207)

Three Years' Experience with Vaccination against the Common Cold.

R. Vance Ward publishes the results of three years' experience with vaccination against the common cold. After preliminary trials a large group of Montreal factory employees were given inoculations over a period of two years with stock vaccines designed to prevent the occurrence of acute respiratory disorders. Care was

taken to select those people who had had a bad record of trouble from those disorders. Over a period of four months careful records were kept of the time these people lost from pneumonia, bronchitis, influenza, colds and tonsillitis, and their record was compared with that of a control group consisting of all the other employees in the factory. In 1929-30 considerable improvement was observed in the record of the vaccinated group, in 1930-31, although there were fewer absences among the vaccinated group, the number of days lost per 100 in this group was slightly greater than in the control group. A few irritating but no serious reactions or results occurred. Most of those inoculated seemed to feel that they had been benefited. It is perfectly clear that the stock vaccines used cannot in any sense be considered a sure and specific preventive of acute respiratory disorders in the dosage we used. That they do benefit a large percentage of people is apparent from the fact that the absenteeism of a group of people who are habitual sufferers from respiratory troubles can be reduced to a point below that of a control group. There are apparently a good many individuals on whom the vaccine has no effect whatever—(*Canadian Medical Association Journal*, October 1931, xxv, 408)

The Treatment of Pulmonary Tuberculosis.

In his annual report G. Lissant Cox mentions that the Lancashire County Council has adopted the policy of encouraging the tuberculosis medical staff, in addition to their ordinary duties, to engage in research work and to give trials to the various new methods of treatment of the disease which are from time to time recommended as "cures" for tuberculosis. The names are given of 19 different methods which have been tried in this way, and the only one which could be said to have any good influence on the progress of the patients was sanocrysin. On this preparation G. Jessel reports as follows—"In the last report I referred to 25 male patients with acute bilateral disease who had completed a course of sanocrysin treatment, 14 of these showed definite clinical improvement while the condition of 11 was unaffected or worse. During 1930, 10 patients completed a full course and 5 of them showed obvious improvement. Altogether at the end of March, 1931, 33 patients had had a full course of sanocrysin treatment, 20 of these showed definite clinical improvement, whilst 13 were unaffected or worse. Having regard to the fact that the patients were bilateral febrile cases with positive sputum these results may be regarded as reasonably encouraging. On the other hand, in a number of cases the treatment was discontinued after two or three doses as its use was obviously contra-indicated. It is helpful to some patients whose condition precludes artificial pneumothorax, but it is useless for very advanced acute cases with poor resistance. Sanocrysin appears to act by virtue of a stimulating action, which varies in intensity, and its exhibition implies a certain power of response on the part of the patient. The technique has been weekly intravenous injections in sterile normal saline of 0.10, 0.20, 0.35, 0.50, 0.60, 0.75, and 1.00 grams sometimes repeated."—(*Prevention and Treatment of Tuberculosis in the Administrative County of Lancaster. Report of the Central Tuberculosis Officer of the Lancashire County Council for 1930*, p. 17)

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casualty room and a fortnight in the wards can diagnose with absolute confidence and after a few weeks in general practice is perfectly certain of one thing only—a feeling of uncertainty” Some frank insistence is laid on the frequency, 50 per cent, of complaints, the exact cause of which remain undiagnosed There is much wisdom to be picked up while you read this record of another’s extensive experience

Emergency Surgery By HAMILTON BAILEY, F R C S Volume II, Thorax, Spine, Head, Neck, Extremities Bristol John Wright & Sons, Ltd, 1931 Pp 415 Illustrations 430 Price 25s

THE second volume of *Emergency Surgery* (the first volume of which was reviewed in THE PRACTITIONER in Feb 1931, cxxvi, 284) appears as a successor to a publication of established value, it covers a more extensive field very compactly prepared Its extensive range envelops conditions consequent on acute disease and injuries as well as the treatment of the initial state, and also includes such comparatively recent fields of exploration as Trendelenburg’s operation for pulmonary embolism and the Winnett-Orr treatment of compound fractures and osteomyelitis The various sections are exhaustive, but certain conditions described may be claimed as beyond the approach of all but specialists, while some points are somewhat liable to controversy, more particularly in reference to the teeth and jaws, and the treatment of carbuncles The chapter dealing with acute infections of the hand is written in a very clear manner, ably discussing anatomical points and thereby simplifying the treatment in basing it on practical lines, such is also the case in respect of the present day principles as regards amputations and the production of functional stumps The book is a useful addition to the surgical literature, and with its counterpart forms an essential for reference in the hands of all who anticipate dealing with emergency work The illustrations are of the standard fulfilled in the first volume, and the general reproduction excellent

Observations on the Courses of different Types of Bright’s Disease and the resultant Changes in Renal Anatomy By D D VAN SLYKE and nine others Medicine Monographs, No xviii London Baillière, Tindall and Cox, 1930 Pp 130 Colour plates 4, half-tones 37, 56 charts Price 13s 6d

THIS is the report of a group of workers at the Hospital of the Rockefeller Institute for Medical Research, New York, on an investigation begun in 1926, and dealing with 67 cases of Bright’s disease Following Volhard and Fahr in Germany and T Addis in their own continent, the authors recognize and describe three chief forms of renal disease, the functional and clinical manifestations being thoroughly considered and correlated with the structural changes, but without detailed consideration of the etiology and treatment These three forms are (1) hæmorrhagic nephritis, (Addis) or glomerulo-nephritis (Volhard and Fahr), characterized by hæmaturia, acute, intermittent or chronic, usually with raised

blood pressure, and nitrogen retention, frequent in the acute, regular in the advanced chronic stage. This group therefore includes the sequels of acute nephritis, the subacute condition, the contracted white granular kidney, and many of those formerly called chronic parenchymatous nephritis. (2) Arteriosclerotic Bright's disease (Addis) or nephrosclerosis (Volhard and Fahr) is characterized by insidious onset, well-marked hypertension and the absence of cedema except from cardiac failure, and death from cerebral hæmorrhage, uræmia, there is obliterating arteriolitis with varying destruction of the glomeruli but little tubular change. In the rapid malignant form glomerular inflammation is super-imposed on the arteriolar disease. (3) Non-hæmorrhage degenerative renal disease (Addis) which the authors prefer to nephrosis (Volhard and Fahr) may follow various intoxications and infections, pregnancy, osteomyelitis, syphilis and tuberculosis, clinically hæmaturia and high blood-pressure are absent, and cedema often massive, much albuminuria, a fall in the plasma-albumin and an increase in the fat and cholesterol content of the blood are characteristic. Contrary to the opinion of others the authors find that urea-retention and uræmia may occur. This is an admirable monograph and gives in the clearest manner a logical classification of Bright's disease.

The Renal Lesion in Bright's Disease By THOMAS ADDIS, Professor of Medicine, Stanford University, and JEAN OLIVER, Professor of Pathology, Long Island College of Medicine, and formerly Professor of Pathology, Stanford University New York. P. B. Hoeber, Inc., 1931. Pp. xi and 628. Full page plates (2 in colour) 170, text illustrations 21, 1 folding plate. Price 16 dollars.

THIS remarkable monograph, the outcome of ten years' careful clinical observation, and post-mortem examination of seventy-two patients with different forms of Bright's disease, has as its object the comparison of the bedside manifestations with the morbid changes in the kidneys in order to determine the degree of correlation between them. Nearly half the volume is occupied by the combined report of the clinical and pathological accounts of the patients, each case being accompanied by plates showing the morbid changes. The other chapters are contributed by the clinical or by the pathological author according to their contents. Thus the senior is responsible for those on clinical methods, clinical definitions, a clinical classification into hæmorrhagic, degenerative, and arteriosclerotic Bright's disease, and the clinical summary and comparison of the clinical with pathological data. Professor Oliver naturally contributes the chapters on pathological methods and definitions, and also on a correlation of the clinical and pathological observations, on a theoretical description of the course and sequence of the pathological processes in Bright's disease, and the final one on a classification and theory of Bright's disease. In this last chapter the confusion of the nomenclature is exposed, and in order to "cloak this multitude of nosological sins," the eponymic Bright's disease is advocated from a pathological standpoint and the divisions mentioned above, and adopted by his

clinical colleague, are accepted. But, while the attractiveness of sharply cut divisions is obvious, it is fully recognized that combinations of various lesions occur in all forms of the disease. This is a philosophical critique based on laborious research, free from dogmatism, and likely to be more thankfully appreciated at its proper value by the thoughtful scientific physician with one foot in the laboratory rather than by the busy denizen of the consulting room.

Motives and Mechanisms of the Mind. An Introduction to Psychopathology and Applied Psychology. By E. GRAHAM HOWE, M.B., B.S., D.P.M. Pp. xi and 260. London: *The Lancet*, Ltd. Price 10s. 6d.

THIS is a brief but comprehensive survey of the whole field of psychopathology, an attempt to simplify into coherence (as "the science of human motives and behaviour") all those variations of emotional development which have been so widely analysed in modern literature, medical and otherwise. Dr Howe's book is, however, more than a summary of the observations and inferences of others, and should be a useful tool for those who may have to treat mental or emotional disorders. From the premise that, though "nerves" are part of the organic basis of our equipment, many "nervous" manifestations proceed from the mind beyond the nervous system, and so ought not to be defined as "nerves" or "neurasthenia" (to which latter word Dr Howe restores its proper and limited meaning), the author shows the need for psychological diagnosis and treatment. With Freud, he regards each individual as "the sum of certain racial experiences acquired by repetition over a long period of evolution," and refers many of those fixations and predispositions which mar, or at least mark, numerous lives, back to distortions of these tribal inclinations. The rôles of the father and mother in relation to children are those of law-maker and protector respectively, and individual development is from endogamous self-love to monogamic mate-love, with polygamy and homosexuality as intermediate states. The most interesting and clearest chapters are those on Defence Mechanisms, and Guilt and Inferiority. Simple diagrams, and cases from the Tavistock Square Clinic and the Psychological Department of St Thomas's Hospital, support Dr Howe's classifications.

The Conquest of Old Age. Methods to effect Rejuvenation and to Increase Functional Activity. By PETER SCHMIDT, M.D. Translated by EDEN and CEDAR PAUL. London: George Routledge and Sons, 1931. Pp. xvii and 321. Full-page plates 40. Price 21s.

THIS large and strikingly illustrated book is admittedly designed for laymen as well as the medical profession, and follows a smaller volume on "The Theory and Practice of the Steinach Operation," translated from the German in 1924. In the present well-translated work the author is not so much concerned with the problem of increasing the average duration of life as with that of prolonging the span of maturity and full vital efficiency, his aim is also "to

discredit the exuberant assertions of quacks " He is an enthusiastic advocate of Steinach's operation of ligature of the vas deferens, and so by reactivating the ageing "puberty gland," as Steinach called the interstitial cells of the testis, to rejuvenate men, the same result, of increasing the activity of the interstitial cells in the ovary and so to bring about rejuvenation in women, is to be obtained by the application of diathermy, instead of X-ray exposures, as originally practised, in women This thesis is developed at considerable length in five sections, and the results of other practitioners are freely quoted, for this book is "concerned not with fables, but with facts", he, however, considers that requests for statistics as to the results obtained show a lack of insight into the peculiar and exceptional nature of this branch of research As he has been travelling about a great deal he finds it difficult to give full statistics of his own results, and so contents himself with saying that during the last two years he has had a higher percentage of successes than that (77 per cent) obtained with Steinach's operation by Benjamin of New York in 1926

The Thyroid and Manganese Treatment Its History, Progress and Possibilities By HERBERT W NOTT, M R C S, L R C P
London William Heinemann (Medical Books), Ltd, 1931
Pp xv and 265 Price 7s 6d

THIS is a full account of how the author evolved the treatment of a number of diseases by thyroid, to counteract hypothyroidism, combined with permanganate of potassium to detoxicate the intestinal tract This method of treatment was suggested by the author's experience of many cases of patients in a subthyroid state after the war and by his own sufferings from intestinal disease At first the permanganate was administered by rectal injection only, but in 1925 a combination tablet of thyroid and permanganate of potassium was given by the mouth and found to be effective Subsequent variations in the method of treatment are carefully described The first of a number of papers published by the author on this subject appeared in 1925, and these are reproduced in an appendix of 50 pages Illustrative cases of various diseases treated by this method are given, they include pneumonia, high blood-pressure, cardiac disorders, mucous colitis, diabetes mellitus and chronic rheumatism The question of any ill-effects, such as manganese poisoning, from the treatment is considered, but none has been noted, a warning, however, is thrown out against combining vaccine therapy with the detoxication treatment.

The Diagnosis and Treatment of Venereal Diseases in General Practice
By L W HARRISON, D S O, M B, CH.B, F R C P E, Brevet
Col R.A.M.C With a chapter on Medico-legal aspects by
F G. CROOKSHANK, M D, F R C P 4th ed Oxford University Press
London Humphrey Milford Pp 567 Price 25s

THIS work needs neither praise nor introduction It is already established as an inspiring guide to knowledge of the diseases it describes, and well merits that happy position The danger of under-treatment in the early stages is convincingly shown, though

the general practitioner may feel that his economic difficulties, in avoiding this, are not fully appreciated. Much information is given in the chapters on the central nervous system, particularly regarding early symptoms. Every kind of psychic disturbance may occur, and the author insists that there is hardly any limit to the variety of mental symptoms which may be produced. There is a welcome emphasis on the value of examination of the cerebro-spinal fluid in this type of patient. In point of sheer mass of clinical material the general practitioner is more concerned with latent or hereditary syphilis and its obscure symptoms than with the acute disease. We hope the author in the next edition will devote a special chapter to this, emphasizing the insignificance of a negative Wassermann reaction in this class, and embodying a précis of the pathological researches of Warthin and the experimental work on animals, which he ably summarizes in the "System of Bacteriology" (1931). This would constitute a formula applicable by the clinician to symptoms whose variety and number defy proper description. A knowledge of the *modus operandi* of the various therapeutic agents is essential, and here the reader will find a lucid summary. The chapter on medico-legal aspects will repay study by anyone habitually called to give evidence in courts of law.

Early English Drug Jars By GEOFFREY ELLIOT HOWARD
London. The Medical Society, Ltd. Pp 50 2 plates in
colour and 21 in monochrome Price 10s 6d.

THE author and the publishers alike are to be congratulated on this charmingly printed and illustrated monograph. Old drug jars are attracting an increasing amount of attention among collectors, not only because of their decorative appearance and as interesting specimens of old pottery, but because of their fascination as having been actually used and handled by old forgotten apothecaries and having held their queer concoctions. Many of the most decorative drug jars seen in collections are Italian or French, but the English ones have a homely charm of their own. Those dating from before the Great Fire are extremely rare, probably because most of the apothecaries had their houses in the City of London and were burnt out, but Mr Howard describes and illustrates a few dating from the first half of the seventeenth century. This is the first book to be published on the subject of old English drug jars, and we warn readers that if they do not already collect them, this attractive book is liable to start them doing so.

Repeated Doses By JOYCE DENNYS London John Lane, The
Bodley Head, Ltd 1931 Pp 157 Illustrations, by the
author, 20 Price 5s

Like *Mrs Dose the Doctor's Wife* last year, by the same author, this amusing little book solves the Christmas present problem for doctors' wives, for Miss Dennys is the Joan of Arc of that down-trodden race, if a little unkind to their husbands.

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